The Journal

OF THE

AMERICAN DENTAL ASSOCIATION

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EXPERIMENTAL REMINERALIZATION OF DENTIN

WILMER SOUDER, Ph.D.,* and IRL C. SCHOONOVER,† Ph.D., Washington, D. C.

CARIES AND CHEMICAL REACTIONS

THERE is abundant evidence to justify one in assuming that a considerable, if not a major number of the conditions associated with dental caries are of a chemical nature. An attack on the teeth by organic acids produced by fermentation processes in the oral cavity is thought to be the ultimate cause of tooth destruction. Bacteria and systemic changes undoubtedly are of importance in that they may modify the structure of the tooth, the amount and kind of acids produced, the prophylactic measures set up in normal health and the environment in which the chemical attack occurs.

It is difficult to evaluate these factors because of the variables involved. In fact, an inability to evaluate completely these variables has been the excuse for the many conflicting theories as to the cause and prevention of dental decay. Dietetic and other health measures cannot be entirely successful until the nature of the chemical reactions involved in dental decay is known. Just why one tooth or a section of a tooth is more resistant to attack than another must be determined.

The total or average chemical composition of the tooth is well established. The differences between the enamel and the dentin are known. The major inorganic component, tricalcium phosphate, is found in greater percentage in enamel than in dentin. The enamel is harder and shows crystalline-like structures which are held together with a minimum of binding material. The dentin has a more porous type of structure. Other elements are present in both enamel and dentin. They vary in amounts with individual teeth and may vary in amounts in different sections of the same tooth.

Such information on the chemical composition and structure of enamel and dentin is of value, but it must be remembered that, in most instances, it is the average composition of the tooth that is determined. A chemical analysis can give only the amounts of the elements present and does not state in what

*Principal physicist, National Bureau of Standards.

†Analytical chemist, National Bureau of Standards.

Fig. 1.—Section of a tooth polished and indented. The indenter marks are seen in the dentin area. A small area of enamel shows at the left. (Linear magnification ×200.)

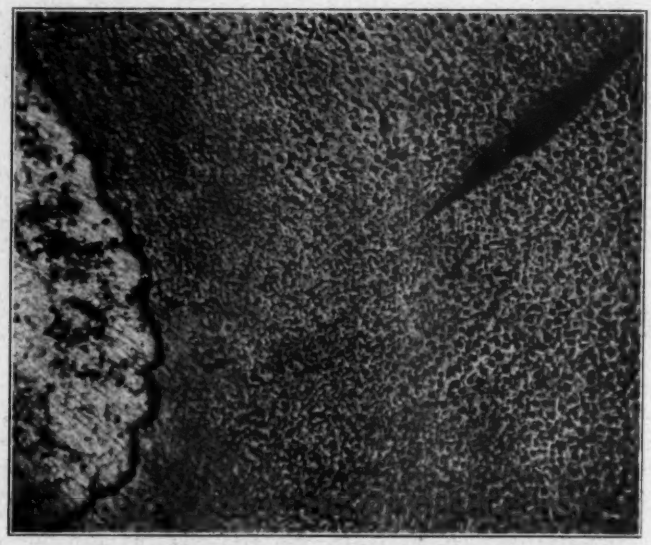

Fig. 2.—Tooth in Figure 1 after immersion for twenty hours in slurry prepared by mixing water and commercial tooth powder containing sodium metaphosphate as major constituent. Etching of the dentin is evident.

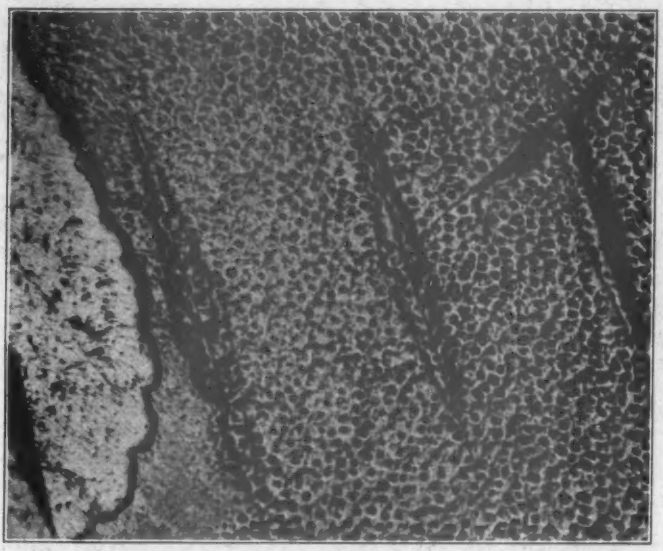

Fig. 3.—Tooth in Figure 2 after immersion for sixty-eight hours in slurry of water and same tooth powder. Severe etching of the dentin is evident. The indenter marks appearing in this figure and not in Figures 1 and 2 were placed on the tooth after the twenty hour immersion period to determine whether the hardness of the dentin had changed during the etching process. (See text for degree of softening.)

Fig. 4.—Polished area of enamel and dentin indented and exposed twelve days to fluoride paste. No structural injury is evident on this surface, originally polished for a more searching disclosure of possible attacks.

type or types of compounds they exist, nor does it give much information as to why one area of a tooth breaks down while another area of the same tooth may never show any signs of deterioration.

VARIATIONS IN STRUCTURE

Structurally, no two teeth are alike, nor do all areas of the same tooth have the same structure. The compounds which make up a tooth may be deposited in a number of forms. They may appear as masses of large or small prismatic rods, porous sections or even amorphous deposits. The small opaque spots observed on teeth are indicative of a difference in structure. In hardness, such opaque areas are different from the clearer surrounding enamel. This nonuniformity usually indicates areas which are more readily attacked than others. Deep pinhole caries indicates that only a small area of the enamel was initially attacked. The absence of recurrent decay around most well-placed restorations means that the more soluble constituent, originally so abundant in that area, was removed in the cavity preparation or that the oral environment has been improved.

The environment of the tooth in the oral cavity is such that variations in exposure to chemical attack are possible over the surface. Acids may form in isolated areas. This too will contribute to the development of areas more susceptible to attack. Furthermore, if the material binding the enamel rods into a unit is defective, acid attack may destroy it. Naturally, the unsupported enamel rods will then be easily disintegrated.

Fig. 5.—Tooth in Figure 3, first after treatment with sodium fluoride and then after twenty hours immersion in a slurry prepared by adding 5 gm. of calcium sulfate in water ($CaSO_4 . H_2O$) to 100 ml. of water. Deposition of calcium fluoride by this treatment has almost completely filled the pits in the dentin.

CHANGES RESULTING FROM CHEMICAL TREATMENT

Since the tooth is made up of, or is susceptible to being changed into, a

number of dissimilar areas because of nutritional, chemical, structural or environmental differences, the possibility of treating these areas externally is of importance. The possibility of reconverting a soluble area into a more insoluble form or the conversion of a normally insoluble area into a more soluble material must be recognized. Such conversions are not without some experimental foundation at the present time. The action of fluoride in drinking water to prevent caries[1] may be that of converting a more soluble form of apatite in the tooth into the more insoluble fluor-apatite. Bone and tooth material are known to absorb fluorides. Powdered bones and teeth have been used to remove this element from water. The successful treatment of sensitive teeth with fluoride paste and solutions has received much attention. Other chemicals have been employed for the same purpose.

Because of this clinical evidence as to the effect of the use of fluorides as a preventive measure against caries in teeth, we have attempted to obtain pertinent data on the chemical and structural changes which may occur in such treatments.

EXPERIMENTAL PROCEDURE

The experimental procedure described in a previous paper[2] was used, with some slight modification. Freshly extracted teeth were ground away parallel to the axial direction to a depth of 1 or 2 mm. The exposed flat surfaces of enamel and dentin were then polished and indented with the Knoop pyramidal-diamond indenter.[3] (Fig. 1.) The length of the indentation marks indicates the hardness of the immediate surface areas. The longer indentations show the softer areas. All teeth were apparently of normal quality and free from decay or restorations. The hardness values of

Fig. 6.—Tooth in Figure 5 after a jet of running water had been directed on restored dentin surface for twenty hours. The major portions of the holes are filled even after this drastic treatment.

enamel and dentin were near the Knoop numbers of 250 and 50, respectively. Those areas of the tooth to be studied were then photographed. A standard type of research microscope fitted with polaroid disks to polarize the incident light and analyze the reflected light gave excellent detail of structure and was used for this purpose.

The Knoop type of indenter has its own inherent advantages. The hardness of the surfaces may be determined before and after each operation on the tooth. Any change in structure that results from the conditions of the experiment and that affects the hardness of the tooth is determined by indenting the area after the operations of the experiment. Also, the size and depth of the indented mark may be measured and, from this, it is possible to calculate the rate of attack of the surface when the rate at which the indentation marks disappear is determined.

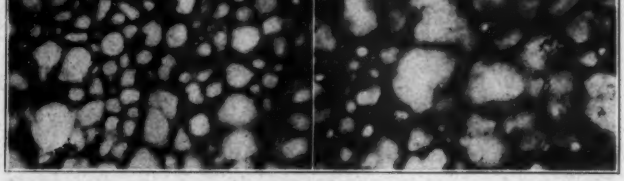

Fig. 7.—Two electron microscope photographs of etched section of dental enamel made through replica of etched surface. (Approx. ×5,000.)

RESULTS

Figure 1 shows a section of dentin of a tooth polished and indented in this manner.* The linear magnification of all illustrations showing indentations is approximately 200.

Because of the difficulty of photographing structural changes on a highly polished surface, the tooth was etched by immersion in a slurry, prepared by mixing a tooth powder having sodium metaphosphate as its principal ingredient with water. Figure 2 shows the tooth after twenty hours' immersion. Brushing was not done on the tooth. Figure 3 shows the tooth after sixty-eight hours' immersion. Severe etching is evident. The tooth was removed from the slurry each day, washed gently in a stream of water and placed in a freshly prepared slurry. The new indenter marks shown in Figure 3, and not in Figure 2, were placed on the tooth, after the photograph in Figure 2 was made, for the purpose of determining whether a change in hardness had occurred during the etching process. The original hardness number was 50 (Knoop) and the hardness after twenty hours of etching was 45. After four months' exposure to the slurry, the hardness number was 20. (These values are averages rounded to the nearest 5.)

The tooth, after being etched in this manner, was placed in a solution prepared by mixing 1 gm. of sodium fluoride with 100 ml. of water. The tooth remained in this solution for twenty hours, after which it was removed, washed and dried. No change was detected.

Figure 4 shows the polished surface of a section of a tooth indented and exposed for twelve days to a fluoride

*All photographs used in this paper were first shown publicly March 18, 1944, when this report on remineralization was made at the Chicago meeting of the International Association for Dental Research.

paste described by Hoyt and Bibby.[4] The surface was washed daily and a fresh mass of paste was applied for the next twenty-four hours. The sharpness of the lines along the indentations discloses no disintegration by the fluoride. Neither could any signs of attack on the structures of enamel or dentin be detected by comparison of photographs made before and after the paste was applied.

REMINERALIZATION

If the etched tooth (Fig. 3), after immersion in the fluoride solution, is placed in a solution containing calcium salts, a very definite change in the structure of the tooth surface is evident. Figure 5 shows the tooth seen in Figures 1, 2 and 3 after these periods of immersion. The tooth was immersed first in the fluoride solution for about two hours, after which it was blotted dry and then immersed in a mixture of calcium sulfate ($CaSO_4 \cdot H_2O$) and water and left for twenty hours. The pitted surface of the tooth has been completely changed. Our explantion of this observation is that fluorides absorbed by the tooth during immersion in the sodium fluoride solution are precipitated as insoluble calcium fluoride when the tooth is immersed in the calcium sulfate-water mixture. The holes etched in the tooth are filled by this process with a material probably more insoluble than the tooth itself.

To obtain some idea of the permanence of such a deposit, the tooth, after the foregoing treatments, was placed under a jet of running water and left there for a period of twenty hours, after which it was again photographed. Figure 6 shows the tooth after this treatment. The major portions of the holes are filled even after the drastic treatment of a stream of water directed against the area.

The etched pockets in the tooth were effectively plugged by the treatment. It is possible that much the same process is involved in the fluoride treatment for sensitive teeth which have exposed dentin.[4] Fluorides are absorbed and repre-

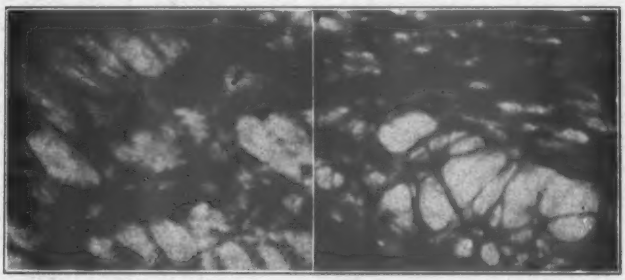

Fig. 8.—Electron microscope photographs of etched enamel on two additional teeth. The photograph at the left show rods cut at an angle of 45 degrees. The photograph at the right shows an area of a more closely arranged enamel structure. (Approx. ×5,000.)

cipitated as calcium fluoride by the calcium present in the saliva. The polished dentin of the tooth in Figure 1 shows some evidence of porosity. If this open structure is a means of transferring shocks to the nerves, then any method whereby the passage is blocked would lessen the transfer of shock.

The fluoride and calcium treatments may be very effective in reducing erosion of dentin and, what is more important, might be employed to arrest caries[6] and produce a partial restoration within the cavity. Certainly the chemical treatment of a chemical compound to convert it

into another form should not be regarded as startling even if applied to teeth. The treating of deep cavities with particular reference to a possible local or surface remineralization prior to the insertion of a filling material should be given further study by qualified clinical investigators.

The experimental results reported above afford a chemical basis for the observation[6] by many investigators that dental caries and fluoride content of teeth appear in inverse ratio.

ELECTRON MICROGRAPHS

The experimental work thus far has been done on dentin, largely because of the difficulty of obtaining with the ordinary optical microscope sufficient magnification to reveal structural changes in the more dense enamel. It is hoped to extend this work to the study of enamel by the use of the electron microscope. Some evidence has been obtained that the method of photographing replicas of etched surfaces of enamel at a magnification of from 5,000 to 10,000 will reveal structural and chemical changes in the enamel in much the same manner as was employed on dentin with the optical microscope. Figures 7 and 8 show sections of dental enamel made in this manner. The teeth were polished and the areas to be studied were covered with a thin film of an organic resin that in itself had no structure. These films were then stripped from the teeth and photographed. No structure was observed. The teeth were then etched by being placed in a sugar solution to which a small quantity of saliva had been added. New replicas made of the etched teeth gave the structures indicated in Figures 7 and 8. It is hoped that, with some improvement in the method of preparing replicas, photographic evidence of chemical and structural changes in enamel, undoubtedly including remineralization of enamel, may be obtained in greater detail.

SUMMARY

1. Decalcified surfaces of dentin were remineralized by treatment with a calcium salt after a preliminary treatment with a solution of sodium fluoride.

2. The remineralized surfaces appear to be fairly insoluble as was to be expected with a calcium fluoride salt, which is known to be less soluble in water than are the tricalcium phosphate salts, generally accepted as the form in which calcium appears in teeth.

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PATHOLOGIC OCCLUSION: A MAJOR CLINICAL PROBLEM

DAVID W. MCLEAN, D.D.S., San Marino, Calif.

WHEN I graduated from dental college in 1905, the profession was treating the tooth as a thing apart from the rest of the body. Acute periapical abscesses were converted into "blind" ones. Loose "pyorrhea teeth" were splinted so they could not be sloughed out. Pulps were routinely devitalized with arsenic, to avoid the pain of curetting neglected carious cavities. The less said about the bridgework of the period the better. W. D. Miller's 1891 paper on "The Human Mouth as a Focus of Infection" was known to few.

With the years came knowledge of the dependence of dental health on nutrition, metabolism and general health; also of the dependence of general health upon good oral health. Today, we are not treating teeth *per se:* we are treating patients.

Another great change of concept relates to the functions of teeth. Previously, prosthodontists, orthodontists and general practitioners had esthetic values and centric closure as their objectives. To date, prosthetics has progressed from statics to three-point contact, to balanced occlusion and, finally, to full cuspal coordination of the dentures throughout the range of functional jaw movements. Today, it is conceded that the orthodontist is "setting up" natural teeth for functional, coordinated occlusion and should know as much about the physiology and mechanical principles of mastication as should the prosthodontist. The general practitioner is becoming increasingly aware of the importance of dynamic occlusion in restoring individual teeth.

A few years ago, I made a motion picture analyzing "balanced" natural dentures in function and demonstrating that so-called "balancing" cusps not only balance the dentures during mastication by their contacts on the inactive side of the mouth, but also engage importantly in shearing operations on the active side of the mouth. It demonstrated too that lack of "balance" not only greatly reduces masticatory ability, but also, through excessive force delivery upon interfering teeth, induces future pathosis of their periodontium.

In the modern concept, Dentistry has two broad objectives: (1) to maintain or restore oral health and (2) to maintain or restore oral functions, paramount among which is mastication, essential for the metabolic processes which constitute life. The importance of this concept cannot be too strongly stated. It sums up Dentistry's peculiar service to humanity. It establishes Dentistry as a highly specialized, autonomous profession.

The armed forces have been sufficiently aware of this concept to place oral surgical operations, including the treatment of jaw fractures, in the hands of the dental service, the hands of men who have intimate knowledge of the complex masticatory function that they are to restore. The Wagner-Murray-Dingell bill, S. 1161, would place it in the hands of physicians, who lack that knowledge.

The treatment of a wound, the re-

duction of a fracture—these are simple mechanical procedures, as simple as the grinding of a cusp or the filling of a fissure cavity in a tooth. It is the adaptation of these procedures to biotic, to physiologic requirements, which places them in the dignified realm of surgery. It is Dentistry's heedfulness of those requirements, in even the most trivial dental operation, which raises it from a simple mechanical art to an autonomous, scientific health service. While the significance of our treatment relates to general health, the adaptation of our procedures to highly specialized functions should remove Dentistry from the domination of Medicine in the various social health services, as it does in private practice.

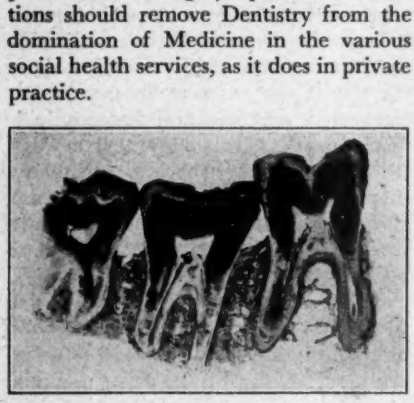

Fig. 1.—Cancellous bone against which teeth are forced by action of inclined planes when teeth are closed in centric interference or excentric intercuspation. (Section by Arthur LaTouche.)

PHYSIOLOGY OF MASTICATION

The normal shearing stroke begins in a lateral jaw relationship. The mandibular denture is dragged across the maxillary, to and through centric relation, and over to the opposite lateral terminal jaw position. If the bolus is on the right side of the mouth, the stroke is from the right lateral, through the centric, to the left lateral. If the bolus is on the left, the stroke is reversed. In either case, the same contacts apply between the dentures.

In right lateral closure, there are, on the right side of the mouth, contacts between an upper and a lower row of buccal cusps and an upper and a lower row of lingual cusps. On the left side, there are contacts of a row of mandibular buccal cusps against a row of maxillary lingual cusps. As the dentures slide to centric relationship, all of these mandibular cusps glide down into the fossae of the maxillary teeth. As the mandible swings past the centric into the left lateral relationship, the mandibular cusps ride up the planes of maxillary cusps until, when the left lateral relationship is reached, there are, on the left side of the mouth, two rows of buccal cusps in occlusal contact and two rows of lingual cusps; on the right side, contact of a row of mandibular buccal cusps with the

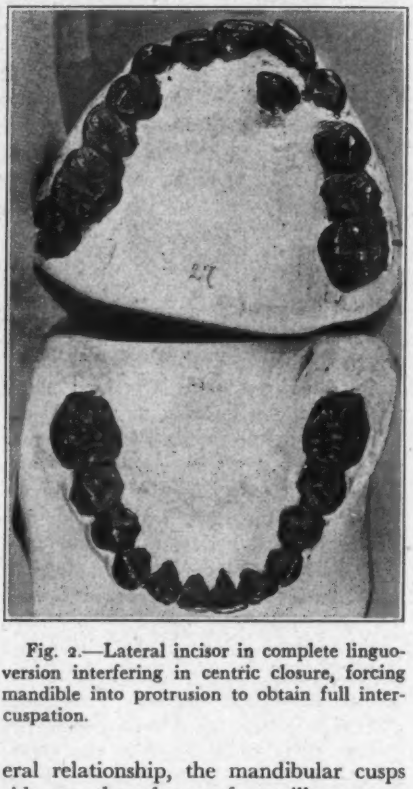

Fig. 2.—Lateral incisor in complete linguoversion interfering in centric closure, forcing mandible into protrusion to obtain full intercuspation.

row of maxillary lingual cusps. This is the picture of full cuspal coordination. During the entire stroke, the force of occlusion is distributed over all of the posterior teeth.

When cuspal coordination between the mandibular buccal cusps and the maxillary lingual ones is lacking, the mandible glides from the lateral to the centric relationship and stops, returning to the lateral position for another short stroke to centric position, for the reason that, should the mandible pass beyond centric toward the other lateral jaw position, excessively high contacts on the opposite side of the mouth would force the teeth on the working or "bolus" side apart; there would be no cutting blades in contact, and the remainder of the stroke would accomplish nothing. This is significant for two reasons. One is that the interfering teeth on the opposite side of the mouth would receive full jaw force. The second is that there would be a loss of the most effective shearing, under the greatest shearing force. The strongest shearing occurs during the second part of the shearing stroke, after centric relationship has been passed and when the mandibular cusps are riding up hill toward the peaks of maxillary cusps. In addition to actual observation, the anatomy of the jaws testifies to this fact. In the maxillae, the force is received down the long axis of the large palatal roots of the molars; in the mandible, by the curvature and the I beam design of lower molar roots supported by the heavy buccal cortical plate of the mandible. I recall in this connection that, in the early days, we were taught to "break out" upper molars buccally and lower molars lingually in the path of least anatomic resistance.

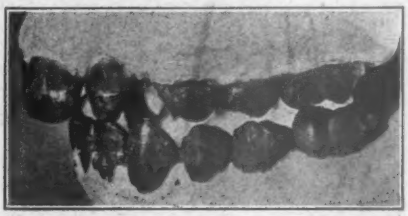

Fig. 3.—Models in centric jaw relationship. Initial occlusal contact is against the misplaced upper lateral incisor, holding the dentures apart.

In the fully coordinated incising stroke, the jaws meet in protrusive relationship, the dentures contacting on the incisal edges of the incisors and on the tips of upper cusp ridges and lower cusp peaks from the cuspids to the third molars. The jaw then glides posteriorly, down many cusp planes, to centric relationship. There may be two or three short lateral strokes in the protruded position, to cut tough substances, before the mandible moves posteriorly to centric relationship.

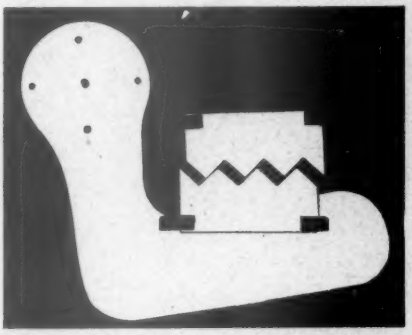

Fig. 4.—Centric interference shown by experimental charts. At this stage of centric closure, full mandibular force is exerted against the mesial plane of the posterior maxillary cusp and the distal slope of the cooperating mandibular cusp.

If, in the protrusive jaw position, only the incisal edges of the anterior teeth are in contact, with the posterior teeth wide open, pathologic force is directed upon the anterior teeth. If only one or two pairs contact, the burden is even more destructive.

These orderly functional jaw strokes depend on the coordination of cusp and ridge height and angulation, with the

pitch and curvature of the occlusal plane of the dentures and with the movements of the jaw as guided by the temporomandibular joints. Since the teeth are inert or passive participants, their coordination depends on just two things—their anatomy, as to both form and dimension, and their position in the jaw. This gives cause for much thought on the part of orthodontists, who deal with tooth position, and of general practitioners, who deal with tooth form and dimension.

From a functional standpoint, derangement of these factors, and therefore of cuspal coordination throughout masticatory jaw strokes, falls into two classifications: derangement of centric relationship and derangement of excursive relationships. Of these two, the first is the more deadly, for a simple reason. In excursive derangements, the force directed upon the interfering teeth is lateral. The tooth is driven against the side wall of its socket. This part of the lamina dura is strongly braced against the nearby buccal or lingual cortical plate of the jaw. In all centric derangement, however, the force upon the interfering teeth is either mesial or distal. The tooth and its lamina dura are driven against the cancellous bone in the trough between the buccal and the lingual cortical plates of the jaw. Cortical bone must change to "shell bone," to haversian bone, to cancellous bone, then to spongy bone, which "melts" away. Cancellous bone is much nearer the melting point to start with. (Fig. 1.)

Derangement of centric relationship is also fatal to artificial denture success. The anteroposterior churning movement of the dentures induces posterior ridge resorption and also breaks down the anterior ridge, while the dentures click and scrape and "just don't chew right." The principal argument for cuspless teeth, if there were one at all, would be that they carry no definite, prescribed centric relationship. If centric position could be *anywhere,* probably 90 per cent of full denture failures would be avoided, or at least postponed.

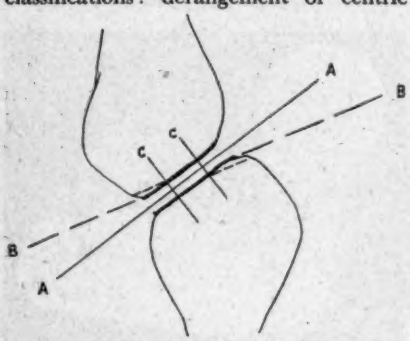

Fig. 5.—Diagram of carbon marks in centric interference, on mesial plane of maxillary bicuspid and distal plane of cooperating mandibular bicuspid. A tapered cut is made from the line C to the peak of the cusp. The cut is deepest at the cusp peak. The area between the lines C-C remains intact to support centric closure. The teeth are shown in full centric closure. The arc of closure has been reduced from A-A to B-B.

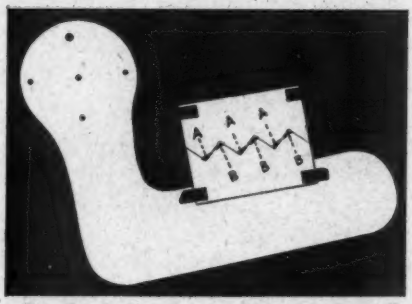

Fig. 6.—Series of corrective cuts on maxillary cusps (A-A-A) and mandibular cusps (B-B-B).

ETIOLOGY AND DIAGNOSIS OF CENTRIC DERANGEMENT

Centric relationship is not a tooth-to-tooth, or denture-to-denture, relationship. It is a mandible to skull relationship. It is dependent on the temporomandibular joints. When the mandible approximates the skull in true centric relation-

ship, dictated by the joints themselves, the upper and lower teeth may be in intercuspation (cuspal interdigitation) or they may not. If they are not, we have an excentric intercuspation.* If they close in full intercuspation, but interfere and slide a little in getting there, we have a centric interference.

Both of these conditions may be caused by eruption of teeth into wrong positions. Excentric intercuspation may be induced by the use of intermaxillary elastics during orthodontic treatment. The elastics may move the mandibular condyle heads into a slightly forward position in their fossae. The teeth are moved to intercuspation in that slightly protrusive jaw relationship, and, after completion of the case, the jaw returns to normal joint and jaw centric relationship. In each jaw closure thereafter, the jaw must move out of centric relation to permit intercuspation of the teeth. (Figs. 2 and 3.)

Centric interference may be caused by the pressure of third molars at the posterior end of the arch. This pressure may squeeze one or more pairs of teeth into extrusion so that their cusps interfere in centric closure. A high restoration may induce it, or extrusion of a third molar or other posterior tooth into an arch vacancy in the other jaw.

In artificial dentures, both centric interference and excentric intercuspation may be due to a loss of centric orientation in taking a wash impression under biting pressure, the upper denture being displaced anteriorly and perhaps tipped upward in the incisal area. Excentric intercuspation may be caused by an incorrect centric registration according to which the teeth are intercuspated on the articulator. Centric interference may be caused by incorrect orientation of the occlusal curvature or by the elevation of individual teeth in the flask under pressure of the plastic material during cure. (Fig. 4.)

Fig. 7.—Excentric intercuspation case corrected by occlusal reconstruction. Right side of models, closed in the excentric (diagonally protrusive) position, used by this patient to produce intercuspation.

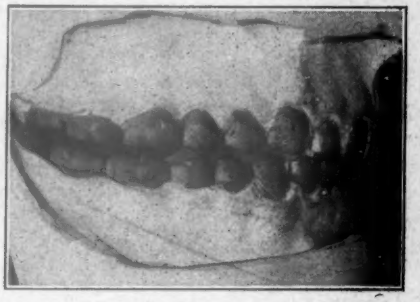

Fig. 8.—Models shown in Figure 7, in centric closure.

In all of these cases, diagnosis and treatment are the same.

Diagnosis depends on the fact that the final phase of jaw closure is a pure hinge movement, taking place by anteroposte-

*The word "eccentric" is rather widely used to designate excursions or relationships of mandible to skull other than centric. The word "eccentric" is defined as: (geometric) "away from the centre or line of a circle," "not having the same centre"; (mechanical) an "off centre rod, as the eccentric rod of an engine"; (in general behavior) "not coincident as to motive or end, deviating from usual practice; irregular, odd, anomalous." The last is the meaning most often attributed to the word by the average reader.

In "excentric intercuspation," the cuspation of the teeth may be perfectly normal except that it takes place out of centric jaw to skull relationship. I therefore prefer *ex* (out of) centric as the word to designate this condition.

rior rotation of the condyle heads in the lower portions of the temporomandibular joints. The patient is rehearsed in rhythmically swinging the jaw open a quarter to a half inch and then almost closed again. He must swing relaxedly, in the air. Usually, he will need light retrusive guidance of the operator's hand upon his chin. After relaxation has been achieved, he is allowed to lightly bring the teeth together as he continues swinging rhythmically. Finally, he stops at the point of initial contact and holds the position. Examination is made to see if there is complete closure, complete intercuspational contact. He is then told to close harder. If nothing happens, the centric position is normal. If the mandibular denture slides slightly forward and upward into complete intercuspational closure, there is centric interference. If the mandible must be moved definitely forward, either directly or diagonally, to effect intercuspation, excentric intercuspation is evident.

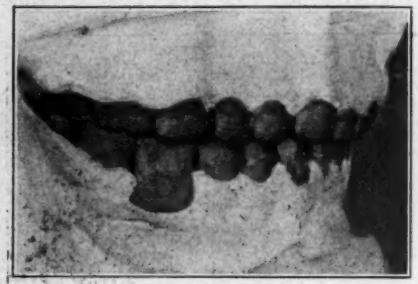

Fig. 9.—Models (Figs. 7-8) after occlusal reconstruction. In this case, the bite was closed, not opened.

Several such diagnostic readings should be made. If interference or excentric intercuspation has been of long duration, the patient has unconsciously acquired a habit of moving the jaw forward and closing vertically, in order to detour around the interference.

If either derangement is demonstrated by these tests, the next step is to insert strips of oil carbon paper on the two sides of the arch and repeat the process, registering the slide from the point of initial closure to the point of full intercuspational closure. The carbon marks will register the points or surfaces of interference. They will be found upon the distal surfaces of lower ridges and cusps, and upon the mesial slopes of maxillary ones. All other marks may be disregarded. Each mark will have its complemental mark in the other jaw, since all carbon marks naturally go in pairs, a maxillary mark and a mandibular.

Since the final phase of centric jaw closure is a hinge movement, each mandibular cusp approaches the maxillary fossa which is to receive it, in a forward and upward arc whose center is in the condyle head on that side of the jaw. If this arc cuts through the tip of the maxillary cusp posteriorly to the receptive fossa, centric interference is created. The correction would be to reduce the tip of the maxillary cusp, to obtain clearance for the lower cusp. This, however, might destroy too much of the maxillary cusp and might destroy the equitable balance supporting a cusp on both its mesial and distal slopes when full closure is made. It is therefore advisable to remove a smaller amount of tooth structure from both the mandibular and the maxillary cusps.

Fig. 10.—Left lateral relationship, before treatment. (Compare Figs. 7-9, 11.)

Passing along the row of mandibular cusps, one removes, by selective grind-

ing, the cusp-peak portion of each distally sloping carbon mark. The cut is deepest at the peak of the cusp and tapers to nothing about half way down the distal slope of the mark. In the maxillary denture, one repeats the process identically except that the marks are upon mesial slopes instead of distal ones. (Fig. 5.)

In the case of artificial dentures in which the interference is of long standing, there will be a compensatory movement of the dentures by displacement of the supporting mucosa. This must be corrected in order that the interference may register. (Fig. 6.)

In all cases, repeated shallow cuts are made, with frequent carbon marking. The interference will diminish progressively until it has completely disappeared.

Fig. 11.—Left lateral relationship, after occlusal reconstruction. (Compare Figs. 7-10.)

In the case of excentric intercuspation, the marks will be like those of centric interference, but considerably longer. In this case, of course, selective grinding cannot correct the derangement. All that it can accomplish is to flatten the inclined planes upon which the initial impact of closure falls, and upon which the slide to intercuspation takes place. Frequently, selective grinding can also provide more points of initial contact—an important point in the case of natural teeth supported individually in sockets in the jaw. Each new pair of contacting teeth lessens the load upon the rest. (Figs. 7-11.)

The only real correction for excentric intercuspation in the case of artificial dentures is remaking or relining them, to transfer intercuspation to the centric jaw relationship. In the case of natural teeth, the only correction in adult life is to resurface all teeth with hard metal castings in which the cusps, ridges, fossae and grooves are coordinated in true centric jaw relationship. This is a tedious, trying operation and a costly one. It is, I think, good policy to ameliorate the condition by selective grinding until evidence of incipient periodontal pathosis demands occlusal reconstruction. The menace of pathosis can be much lessened by judicious selective grinding.

Fig. 12.—X-ray pictures showing periodontal lesion produced by centric interference in which initial contact (and full mandibular force) fell upon lower first molar. The level of periodontal bone is high throughout the entire picture except on the mesial surface of the mesial root of the first molar. The upward slope toward the distal surface of the second bicuspid root is to be noted. Incipient stages will show the same type of resorption, in milder degree.

Some authorities have argued that selective grinding is dangerous. Of course it is. So are the dental bur; the forceps; adrenalin and a host of other drugs and agencies we use every day. The potential danger of a remedial agent does not prohibit its use. It does demand that we learn how to use it judiciously and safely.

Often, the x-ray pictures offer evidence of centric derangement. When there is a uniformly high bone line around the roots of most teeth, with occasional deep interproximal resorption, we should look for a derangement of centric relationship. This is particularly true if the resorption is deep upon the mesial surfaces of lower posterior teeth and upon the distal surfaces of maxillary ones. Force delivered upon a distally inclined plane of a lower posterior tooth thrusts the tooth against the mesial wall of the lamina dura of its socket. Resorption will occur in that wall, the supporting cancellous bone breaking down with the cortical bone. Frequently, the resorption will be deep upon the mesial surface of a lower root and slope upward to a definitely higher point upon the distal surface of the tooth in front of it. (Fig. 12.)

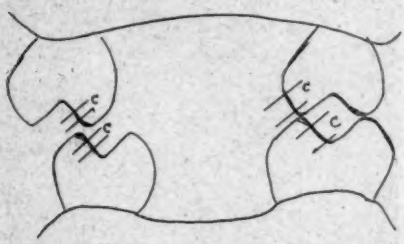

Fig. 13.—Diagram of selective grinding to correct interference of cusp planes which enter into both lateral and centric occlusal contacts. The area between the lines C-C is left intact to support centric closure. This drawing could represent either the beginning of the left shearing stroke (bolus on right side) or the end of the right shearing stroke (bolus on left side).

DIAGNOSIS AND CORRECTION OF EXCURSIVE INTERFERENCE

We are all familiar with the diagnosis of excursive interference. First, to determine the amount of interference and thus the prognosis for correction by selective grinding, the patient closes the jaw in centric relationship and moves it slowly to the protrusive relationship. If, when the incisors are edge to edge, the posterior teeth are wide open, perhaps 3 or 4 mm., it becomes evident at once that correction by selective grinding is out of the question. If, however, one pair of bicuspids touch, cusp peak to cusp ridge, while other posterior teeth are separated by spaces ranging upward to perhaps 1 mm., correction is usually feasible. The contacting teeth must be reduced by an amount equal to the widest separation between posterior teeth.

The next step is to carbon mark the movement into protrusive relationship. At this time, the finger should be laid across the anterior teeth, two at a time, while the patient forcibly brings the posterior teeth together in centric closure. If any anterior tooth is felt to move, or to receive an abnormally sharp blow from opposing teeth, the lower tooth or teeth contacting it should be reduced. Next, the finger should be similarly held while the jaw moves from centric to protrusive relationship. If any tooth is felt to receive considerable force at any point during the movement, the opposing lower teeth should be reduced. Movable teeth should be held firmly under the finger while being carbon marked.

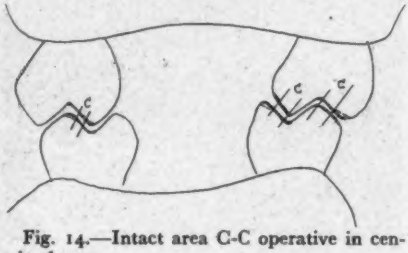

Fig. 14.—Intact area C-C operative in centric closure.

The rest of the needed correction is usually made by reducing the upper anterior teeth and leveling them for improved appearance and so that all of them shall touch evenly in the protrusive, incising position of the jaw.

Often, an incisal edge or corner will have the appearance of having been

fractured. The surface, however, will be smooth and glazed. Investigation will show that the mandible can be moved to bring some long unworn enamel edge or cusp into the worn area, where it will fit perfectly. The unworn, hard surface should be reduced. Often, in correcting the protrusive relationship, unduly long central incisors or cuspids can be reduced, ragged or pitted edges smoothed and uneven anterior teeth leveled, to the great delight of the patient.

For the evaluation of derangement in lateral excursions, the patient closes the jaws in centric relationship and slowly moves the jaw to the right and then to the left terminal lateral position. On the right side, for instance, the buccal cusps of the right side should be in intercuspation, while the balancing contacts should be made simultaneously on the left side. A glance may show that nothing can be accomplished by selective grinding. If, however, several additional pairs of teeth can be brought into contact by reasonable selective grinding, the prognosis regarding the teeth now bearing the load will be much more favorable. As each new pair of teeth are brought into contact, the load upon all other contacting teeth is lightened. It must be remembered, however, that carbon marks must be made upon the two sides of the mouth simultaneously, and all contacting points must be reduced in order to bring more teeth into play.

There are several simple rules for interpreting carbon marks. They go in pairs: each has a complementary mark in the opposite jaw. They should be considered together. Often, a part of each must be removed by selective grinding. The carbon marks in each denture are in series. One should go down the line, giving each mark the same treatment, varying the degree of cutting according to the degree of pressure shown in the marks. One should interpret the marks by visualizing the direction of the jaw movement. When one mark made by that movement is recognized, the entire series becomes visible as such.

There also are several rather simple rules for selective grinding:

1. In correcting the contacts of one

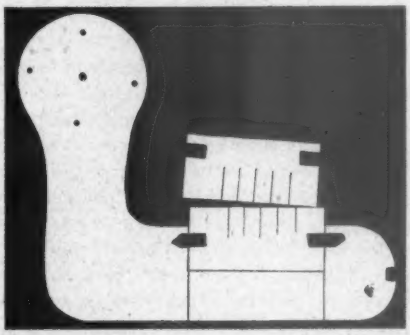

Fig. 15.—Diagrammatic picture of delivery of occlusal force when the bite has been closed through wear of natural teeth or resorption of tissues supporting artificial dentures. Black background or "skull" card with attached block to represent maxillary denture. The white "mandible" card operates on a hinge axis and has an attached denture block. The vertical lines indicate the positions, and lines of axial force, of the upper and lower teeth.

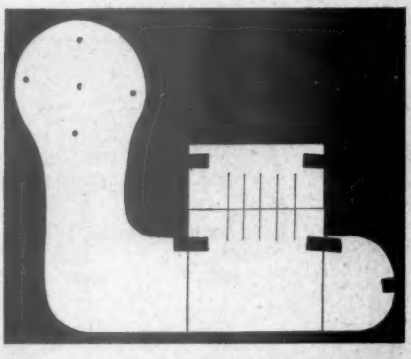

Fig. 16.—Upper denture card moved directly upward, shortening upper teeth, to stimulate closing of bite. Similarly, the lower denture card is moved directly downward, shortening the lower teeth.

jaw relationship, we should not mutilate those of another. We must determine which part of a carbon mark is made in the movement we are correcting and which portion is in centric position, and avoid the centric portion of the mark. For example, the mark made upon a lower cuspid moving from centric into lateral relationship might extend downward from the cusp peak for 3 mm. A corresponding mark lies upon the lingual surface of the upper cuspid, which might be reduced 1 mm. for the sake of esthetics. The complemental portion of the mark on the lower tooth, which will lie toward the gingivae, should be left undisturbed. The millimeter immediately above it should be left to maintain centric contact. The lower tooth can be reduced to the incisal edge of that millimeter to correct the lateral relationship.

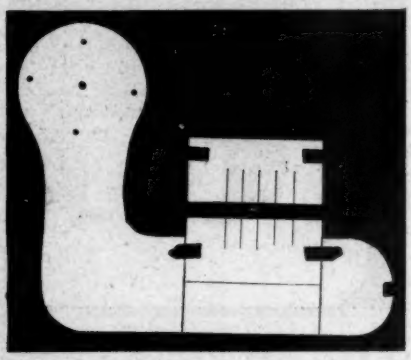

Fig. 17.—Shortening of denture blocks, or teeth, permitting mandible to close too far. Closure is upward and forward on the hinge axis cord located somewhere in the head of the condyles. There is hyperpressure, upward and forward, in the anterior part of the dentures, producing excessive pressure upon the anterior teeth. All mandibular teeth close anteriorly from their proper relationship with their maxillary cooperators. Force is delivered in malrelationship to the long axis of the roots. (The significance of this situation in full artificial denture cases, in which ridge resorption has resulted in a loss of vertical dimension, is not to be overlooked.)

The same reasoning and rule apply to the marks on posterior teeth.

This means that the buccal cusps of mandibular teeth should not be reduced to correct the lateral relationship, since they enter also into centric contacts. The complementary marks upon the lingual slopes of the buccal cusps of the opposing maxillary teeth should be reduced, since they enter into no other mandibular movement except that a point well down toward the fossae may enter into protrusive relationship contacts.

Likewise, the palatal cusps of upper molars and bicuspids enter into both centric and lateral contacts. In correcting the working side, the complemental marks upon the lingual cusps of lower teeth should be reduced.

The balancing contacts between lower buccal and upper palatal cusps should both be cut, to reduce the cusp peak portion of each, since both enter into centric contacts. Such treatment leaves the base of each mark to maintain contacts in centric relationship. (Figs. 13-14.)

2. To close the bite in centric position, we cut in the fossae. Since this is seldom desirable, the fossae portion of carbon marks is usually to be shunned.

3. To reduce cuspal interference, the peaks of cusps are reduced, either in one jaw or in both, as suggested above.

4. All that has been said above refers to teeth in reasonably normal occlusion. In cases of gross malocclusion, other planes may be involved, and it is then necessary to identify and interpret the mark in accordance with the direction of jaw movement.

5. Since only selected portions of small carbon marks are being removed, small carborundum or diamond points should be used. Wheel stones may be used for trimming incisal edges.

6. Since all selective grinding closes the bite more or less, the degree depending somewhat on the correction to be made and still more on the skill of the operator, the anterior teeth should al-

ways be tested for hyperocclusal force, at the close of the operation. (Figs. 15-17.)

7. The last step in the process should be to polish all ground surfaces.

Selective grinding is a procedure to be employed only after practice upon experimental models. Here, as in occlusal reconstruction, it is wise to experiment on models rather than on patients.

It is logical to reduce conflicting teeth or cusps prior to commencing a large number of restorations or replacements by fixed or removable partial dentures, in order that the functional surfaces to be synthesized may be designed to as nearly correct an environment as possible.

This type of surgical occlusal correction should be referred to as occlusal or incisal selective grinding, never as "spot grinding," "lapping in" or "milling," or by some other term so suggestive of mechanics as to rob this operation of the dignity that its complexity and importance merit.

In replacing soft gold or amalgam fillings, the cusp opposing the old restoration area will be found unworn and unduly long. It is good practice to fill in the resulting deep fossa in the new wax pattern to a normal level, and to correct the long opposing cusp when the inlay is inserted in the mouth. In this way, the locking effect so injurious to the periodontium of individual teeth can be overcome and the general occlusion greatly improved.

The test for complete correction of any new restoration consists in placing a thin piece of bond paper between two adjoining teeth. When the teeth can grip and tear the paper, correction has reached the point where polishing and buffing the surface will complete it.

Selective grinding is not a cure-all. It is aimed at only one etiologic factor of periodontal disease: excessive occlusal force. Other etiologic factors must be dealt with by appropriate local and systemic correction. In one respect, selective grinding for the correction of occlusal derangement falls into the same category as the extraction of infected teeth. It is of greater importance as a preventive than as a curative measure. Its promise is greatest before secondary disease has become an established independent entity.

2585 Huntington Drive.

A NEW CONCEPT OF THE CARIES PROBLEM AND ITS CLINICAL APPLICATION

Part II

BERNHARD GOTTLIEB, Dallas, Texas

DISCUSSION

Our clinical approach to the problem of dental caries suggests an approach to the cancer problem on the premise that the diagnosis of cancer is established as soon as necrotic tissue is found. We know that is the last stage of cancer formation. The finding of a carious cavity is likewise the last stage of caries. We are interested in a study and diagnosis of the early stages based on pathology. Only such knowledge can aid in scientific progress.

In studying the pathology of dental caries, we are not supposed to limit ourselves to the study of ground sections, but must also employ thin decalcified sections. The ground sections are too thick for study under higher magnifications. Possibly because enamel is for the most part lost in decalcification, it is difficult to study enamel conditions in decalcified sections. Fortunately, carious enamel is more resistant than normal enamel to acid action. (Fig. 22.) Thus, we can study carious enamel in thin decalcified sections. Details of these results will be reported elsewhere. Here we refer only to the summary.

In the enamel, we find four different stages in the development of caries. At first, the ladder-like organic framework is thickened in the decalcified section. The slow action of acid on enamel produces transverse striation of the prisms by removing the calcium salts and making the organic structure more visible. (Fig. 22.) The greater accentuation of this organic framework in the decalcified sections of enamel caries (Fig. 5) can apparently only be produced by the invasion of micro-organisms. In this early stage, the prism itself appears to be intact before being dissolved by acid, with empty spaces remaining inside the thickened framework. In the second stage, the calcified prisms become resistant to acid too in the decalcified sections, showing up as a dark column between the black prism sheaths. This may be the cause of the appearance of cloudy enamel in the ground section. It is apparently caused by the invasion by micro-organisms of the prisms themselves. In the third stage, the prism sheaths have disappeared, probably digested by bacterial action. The prisms are not connected with each other and are easily dislocated. Finally, no individual prisms are present. Instead, a necrotic mass is to be found in the carious cavity. In the ground section, the amorphous necrotic material is yellow. The same pigmentation is to be found in the beginning of the carious process when no changes in the histologic structure of the tissue can be observed (Fig. 9). The black stain in this black and white reproduction is brownish yellow pigmentation.

In beginning caries of the dentin, we

find accentuation and widening of the tubuli with localized enlargement by the fusion of neighboring tubuli. Apart from that, we find localized cleft-shaped areas of necrosis developing in the dentin matrix away from the course of the tubuli. In fact, they often run nearly perpendicularly to the tubuli and invasion of the tubuli develops secondarily from these foci. This can be studied only in thin decalcified sections. Here too, the yellow pigmentation is present from beginning to end.

These clefts are produced by dentin shrinkage through acid action and are filled by dentinal lymph from the tubuli. This represents the same pathogenesis as the shrinkage of the dentin at the dentino-enamel junction. (Figs. 13 and 14.)

The carious process proper is seemingly a proteolytic one characterized by production of a yellow pigment. Correspondingly, we can diagnose the beginning carious process by finding brownish yellow pigmentation. At the beginning, no tissue defect has developed, and microscopically the tissue characters are present. As the yellow pigment is not seen in the x-ray picture, we omit its discussion here.

The yellow pigmentation indicates that probably a certain, as yet unknown, group of micro-organisms succeeded in invading the tooth substance. As long as only the enamel is invaded, further penetration may be arrested before the dentin is reached. Arrest may occur in front of a layer of transparent enamel (Figs. 1, 2 and 3) or without it (Fig. 4). Such a condition may remain harmless permanently. The arrest of the process in the dentin is more difficult and will be discussed later.

The carious process is proceeding along the organic roads, as far as they are passable. If an invadable lamella is present, the yellow pigmentation reaches the dentin, considerable areas of enamel around the lamella remaining intact, being affected neither by the yellow pigmentation nor by acid (Fig. 9). We have no means of knowing whether yellow pigmentation of the enamel surface has been arrested or has succeeded in reaching the dentin. Sometimes, we may find a round brownish depression (Fig. 1), the only available indication that a lamella is invaded. Another time, we may find a large brownish area, which indicates that the narrow prism sheaths were invaded. The two stages may be combined, the extended pigmentation stopping half way in the enamel, while the process reaches the dentin by way of a lamella (Fig. 9). It is rarely that such invasion of a lamella, together with the carious process, stops at a barrier of transparent enamel (Fig. 1). It is instructive to observe how the carious process here starts to spread horizontally along the available incremental line, the only outlet of organic nature. Here, we have additional proof that the carious process spreads along the available organic roads.

It might be advisable to point out again that the carious process is similar to the spreading of silver nitrate in impregnating the enamel. Both spread along the organic roads. Thus, it seems justifiable to regard the carious process as proteolytic.

As the carious process consists apparently of invasion of micro-organisms along organic roads, it appears that the only way to check it is by obstructing these roads. The impregnation fluid must have a low surface tension in order to assure deep penetration. The deposited chemical must form a compound with the organic matter of the tooth so that it cannot be washed out by the saliva. The compound must have a high bactericidal power so that it can destroy the micro-organisms which may have invaded, and may prevent further in-

vasion. It must do no harm to the surrounding tissue or the body.

In highly calcified enamel, the only possible invasion route would be roads of organic matter leading to the dentin. The root, having about 30 per cent organic matter (as compared with about 5 per cent in the enamel), is exposed to the mouth fluids, and some experiments show that it is more difficult to protect the root by artificial impregnation than it is the enamel. If the suggested natural impregnation by the saliva fails and root caries develops, it is virtually impossible to save such affected teeth. The only advantage that the root has is the fact that undermining caries cannot develop, the tissue having a homogeneous structure.

Reports are not available in the literature as to how caries of the anatomic root is affected by the presence of fluorine. Some alarming reports (Smith's findings in St. David, Ariz.) make it desirable to obtain more information about that particular phase of the relationship between caries and fluorine. The connection between the cementum surface and the periodontal fibers may also be affected by the presence of fluorine.

The weaker the impregnation, the oftener it must be repeated. If it proves true that saliva is able to impregnate the teeth, impregnation would be possible even if very weak. The saliva flows continuously and even a slight action becomes effective if continuous. In that way, we can explain two peculiar facts. It is established that caries can be produced in rat molars by feeding a certain size of food particles (Hoppert *et al.)*, and that the caries process is far more severe if the salivary glands are removed (Cheyne). It may be that the presence of food of such size, clinging to the tooth, prevents saliva contact to a decisive degree. The same thing might happen in cases of repeated food impaction, which is proved to cause caries in human teeth in many instances. Any protected place is known to become liable to dental caries. Any place freely accessible to saliva shows relative immunity.

It might be, and there are some indications to that effect, that any kind of impregnation along less calcified invasion roads results in added obstruction from some saliva activity. Fluorides do not form a compound with the organic matter, but may stay there for a short time, attracting, as they always do, calcium from the saliva. The poisonous qualities of the used concentrations do not point to a bactericidal action.

We can produce caries in extracted teeth by keeping them in the incubator in saliva that is renewed daily. Caries can be identified by yellow pigmentation. It is easier to produce caries in freshly extracted teeth than on teeth that have been removed from impaction. This experience indicates also that saliva may be responsible for changes in susceptibility to dental caries. In the experiment in the test tube, we allow the saliva to stagnate, so that the micro-organisms present have an opportunity to invade. The rampant caries present in cases of xerostomia points also to the importance of the connection between saliva and caries.

Sometimes, we encounter arrested dentinal caries with a hard black surface. That happens only where the dentin is widely exposed to the action of the saliva. Protected cavity corners, even in the same tooth, continue the carious process. Such experiences point to some strongly favorable change in the saliva, which can act only in easily accessible places. We cannot even suggest of what it consists. Correspondingly, we cannot try to change it.

We sometimes encounter sensitivity to sugar at a particular spot on the enamel surface. We know that there is no pos-

sibility that enamel will become sensitive. Apparently, there is an open lamella in this area which conducts the water soluble sugar to the dentin, where the difference in concentration produces sensation. Impregnating such an area with a silver nitrate-containing compound renders it insensitive to sugar, indicating that the path has been obstructed successfully. We know that sensitivity to sweet is an indication that a cavity will soon develop there. Obstructing such an invasion road, eliminating its sensitivity to sweet by impregnation might mean that micro-organisms too are prevented from entering. This then would be the equivalent of caries prophylaxis.

Eliminating sensitivity from the tooth surface and prophylaxis of dental caries seem to go parallel. The presence of fluorine has also been reported to increase resistance to dental caries and to eliminate sensitivity. In the two, the same principle is involved: obstruction of invasion roads. It might be possible to judge from the duration of desensitization how effective such impregnation might be when used in prophylaxis of dental caries. Paraformaldehyde (tri-oxymethylene), for instance, eliminates sensitiveness, but the condition returns after a relatively short time.

The problem of mottled enamel and its relation to dental caries will be discussed on a later occasion. Here, an explanation should be offered for the assumption that the use of drinking water containing 1 part per million or more of sodium fluoride increases the resistance to dental caries and that repeated local application of sodium fluoride has the same effect. We cannot consider an increased resistance to solubility in acid as a cause, since we have, we believe, proved that dental caries is not the product of acid action, but rather one of invasion of proteolytic micro-organisms along the organic roads characterized by a yellow pigment.

It is well known that fluorine attracts calcium. Anatomic crowns which develop in the presence of fluorine show a layer of hypercalcified transparent enamel sometimes combined with strips of opaque, poorly calcified enamel. These two extremes depend apparently on the presence of fluorine in the matrix or outside of it at the time of maturation of the matrix. If fluorine is in the matrix, that area attracts more calcium than usual and we get transparent enamel. If, however, fluorine is present outside the matrix, the incoming calcium combines here to form insoluble calcium fluoride and can no longer be transported to the enamel. The enamel concerned remains undercalcified. (Schour has described such calcium globuli outside the tooth germ in fluorine experiments.) The presence of a cap of transparent enamel as a rule shows the penetration of fluorine into the maturing matrix to a certain depth, attracting to these places more calcium than usual. The cap of transparent enamel (Fig. 19) appears to be responsible for the resistance to dental caries which fluorine teeth exhibit at eruption.

On contact with erupted teeth, fluorides seem to remain in the organic roads until washed out by the saliva. In fluorine areas, these roads are kept fluorized nearly continuously, especially in the front teeth. Here, they attract calcium from the saliva and that fact might help in obstructing the invasion roads and increasing resistance to dental caries. From that viewpoint, the use of a fluoride mouthwash (Atkins) may be superior to impregnation with sodium fluoride repeated once in several months.

It may seem strange that sensitive root surfaces are seldom invaded by micro-organisms; i.e., affected by caries. Root surfaces become sensitive when a part of their surface has been brushed off. Cementum, like enamel, can never become sensitive. In sensitive cases, the cementum has been rubbed off as well as

a layer of dentin and the openings to the dentinal tubuli have been exposed. Only by obstructing these entrances can we get rid of the sensitivity. Caries can never develop because invasion of such places is apparently impossible owing to the great traffic at the entrance. Invasion is facilitated by eliminating traffic and protecting the places of invasion so that the micro-organisms are not disturbed at their difficult task. We have an illuminating example in our clinical experience. It happens sometimes that an upper first premolar is rotated so that its anatomic buccal surface becomes an approximal one. Sometimes, caries develops here on the unusual anatomic buccal surface. It develops for the most part on the basis of having a lamella available as a highway. As long as that lamella was situated opposite the cheek, invasion was impossible. The micro-organisms could not operate here in view of the great traffic. As soon as the entrance of the lamella became protected in the approximal space, invasion became possible and caries developed.

It seems that the traffic on the buccal side is more effective than that on the masticating planes of premolars and molars even when the occlusal planes are worn down by mastication. Sometimes, we encounter caries in the middle of a worn down occlusal plane. Making a ground section through such an area of beginning caries, we invariably find lamellae. Here, the invasion possibilities afforded by the lamella were apparently so inviting that the present traffic on the occlusal plane could not interfere successfully. On the side walls, the flow of saliva is apparently better than on the occlusal planes.

An extended brownish discoloration, such as we are accustomed to find on contact planes, is not encountered on buccal or lingual surfaces, except for some buccal surfaces of molars. We feel that such an extended pigmentation on approximal surfaces becomes an arrested enamel caries when we extract the neighboring tooth, making the affected plane freely accessible to saliva.

This common belief is reasonable in spite of the fact that we have no exact proof for it. The following explanation may be correct. The invasion of the narrow crooked roads of the prism sheaths is difficult and can be performed only in protected places such as the approximal planes. In addition, the suggested protective action of the saliva cannot act properly in such protected places. If we extract the neighboring tooth, the additional invasion is impaired by removing the protection and the freed surface can be washed by saliva permanently.

Here the fact should be discussed that, in young individuals, where the contact of the teeth is marble-like, cavities develop below the contact points (G. V. Black), while, in older people, where the contacts are worn down to planes, we find caries in the plane itself. (Beust). At the greatest circumference of the contact point, there are nearly no lamellae, while they are crowded in the approximal planes below. In addition, the wearing down to a contact plane means the removal of the harder outer surface of the enamel, exposing the softer, deeper parts. In fact, we may find brownish discoloration limited to the contact plane.

It is an old and proved fact that ingestion of carbohydrates, especially sugar, promotes dental caries in susceptible people. It is also probably undisputed that caries-immune people can eat unlimited quantities of sugar without alteration of their caries immunity.

The following explanation is suggested. Caries immunity means that the organic roads are obstructed and no micro-organisms can invade. Neither can sugar penetrate the organic roads in these cases. In caries susceptibility, the roads are invadable. Sugar sweetens these roads and improves the living con-

ditions for the micro-organisms. The suggested impregnation by some factors of the saliva cannot take place as long as the roads are occupied by sugar. That might be the explanation for the observation, by Jay,* that after eliminating sugar from the diet for some time, some people can return to sugar without showing a new rise of the acidophilus count. The lamellae, emptied of sugar, can become obstructed by natural impregnation, provided the saliva has been favorably changed. A return to sugar can do no more harm because the roads are obstructed. Those, however, who did not get a favorable change in the saliva quality while the sugar was eliminated from the diet again have high acidophilus counts; i.e., as soon as the living conditions of the micro-organisms on the invasion roads are improved by a return to the use of sugar in the diet.

Here we might point out the difference in the explanation of the sugar action in the old and the new caries concept. The acid concept taught us that the carbohydrates are transformed into acid, which decalcifies enamel—and that means caries. The new concept asserts that the sugar itself improves the living conditions of the micro-organisms on the invasion roads, at the same time reducing the suggested possibility of natural impregnation by keeping the roads occupied. Observation of acid activity in the tooth tissues suggests its local initiation by micro-organisms. The possibility of acid action on the tooth surface will not be discussed here. Such an external acid action may have some connection with abrasion.

Unlike carbohydrate, the presence of protein is reported to increase the resistance of the teeth to dental caries. It might be that it changes the quality of the saliva. There is too little information available in that direction.

*Personal communication to the author.

From the discussed viewpoint, an obstruction of every road which might be opened on the occasion of any preparation is advisable. In any preparation, we open numerous dentinal tubuli which represent roads of invasion and avenues of sensitivity. After such a preparation is finished, the exposed surface should be rendered free from sensitiveness by impregnation. That would indicate that all invasion roads are obstructed. Exposed dentin might not be sensitive, especially in older people. Here the dentinal fibrils are apparently calcified, and thus the tubuli are obstructed by nature.

The carious process proper, as indicated by yellow pigmentation, is usually accompanied by acid-producing micro-organisms, to a varying extent. The acid action produced shows up, under the microscope, in the enamel as well as in the dentin. It dissolves out calcium salts from the enamel, making the organic framework appear clearer as transverse striations (Fig. 22). The invasion of micro-organisms into the organic matter accentuates that striation. It is probable that the invasion of the prisms themselves by the micro-organisms is responsible for the cloudy appearance (Fig. 5). The fact that the acid producers form the spearhead in invasion of the prism sheaths in frontal caries suggests that the acid producers proceed better along these difficult ways, while the yellow pigment producers proceed better on the broad road of the lamella. An explanation cannot be ventured at that early stage of knowledge. The appearance of transparent enamel is a product of acid action (Fig. 8). In the dentin, the presence of acid results in shrinkage. Besides, it is responsible for the first degree of homogeneous transparency and for the opaque dentin (Figs. 15 and 18). The fact that the opaque tracts are not to be found in decalcified sections and that we can produce opacity in the test tube (Fig. 18) suggests that it is a product of a shift of calcium salts. All these phenomena dis-

appear when the calcium salts are removed entirely by decalcification.

The removal of calcium salts in dental caries shows up in the x-ray picture.

If calcium salts are removed from the enamel of extracted teeth to a degree generally seen in the x-ray film in connection with caries, the enamel is dissolved in these parts. The acid action in the mouth in connection with caries is quite different from that in the test tube. In the tooth tissues, the acid is produced by the action of micro-organisms in the area of production. That action spreads according to the way of invasion of the micro-organisms which produce it. The produced acid is apparently available in too small a quantity, and cannot penetrate independently. Wherever acid causes decalcification in connection with caries, numerous micro-organisms have invaded that section, replacing the removed calcium salts by the protein bodies of the micro-organisms. Thus, a peculiar condition results: softness of the enamel, which can, like decalcified dentin or bone, be pierced by a sharp needle. We cannot produce such an enamel condition by treating extracted teeth with any kind of acid.

In dentin and bone, there is originally enough organic matter to, roughly, preserve the body in spite of the dissolving out of the calcium salts. The enamel originally has not enough organic matter to yield the same result after decalcification. Here, the organic matter must be enriched while we remove the calcium salts in order to keep the body in shape after removal of the inorganic matter. The only available explanation seems to be that the invading micro-organisms supply the necessary organic matter. This might also explain the appearance of soft enamel when it becomes carious. The removal of the calcium salts alone is not responsible for that result, but also the fact that they are replaced by organic matter. The same explanation applies to the appearance in the x-ray picture. A shaded cone in the enamel means that the inorganic matter has disappeared from that place; but it does not mean a defect in the enamel body (Fig. 23). The depression of some carious enamel (Figs. 1 and 11) is apparently due to shrinkage by removal of the calcium salts, similar to shrinkage of the dentin.

Accordingly, in addition to the x-ray examination, a clinical investigation with a probe can finally reveal the real condition. If the surface contour is intact, the enamel caries might be arrested, and there is no indication for cavity preparation. The roentgenologic defects in the lower premolars of Figure 23 (a) offer no indication for cavity preparation, if the enamel surfaces have been proved clinically intact. Even if there is a small defect present, there is no reason for cavity preparation in every case. If good contact conditions can be maintained, smoothing and polishing of the area of roughness with succeeding impregnation will serve the purpose. All of the foregoing holds true as long as the conditions in the dentin are satisfactory.

If we compare the enamel shadows in the lower premolars with the shadow on the distal side of the upper first premolar, we will have to state that the condition here is better than in the lower premolars (Fig. 23). Also, the wall of apparently healthy enamel at the dentino-enamel junction in the upper first premolar is satisfactory; but the dentin inside the dentino-enamel junction looks quite different. We see here a considerable shadow limited to the dentin (c). If we try to interpret this shadow merely on the basis of x-ray and clinical observation, we shall hardly find a correct explanation. The findings were made at first in the microscopic examination of ground and decalcified sections in beginning enamel caries. When the full explanation of the histologic pictures was available, x-ray films were checked for the equivalent of these findings. They were found in abundance.

More than twenty years ago, it was shown that, in some kinds of beginning caries, the acid accompanying the carious process decalcifies the dentin and makes it shrink away from the enamel (Fig. 12). In later research, it was revealed that that space does not remain empty. When the enamel surface is intact, the shrinkage of the dentin creates a vacuum and draws the circulating dental lymph of that area into the vacuum. The coagulated lymph appears as an amorphous material filling the shrunken space of the dentin (Fig. 13). In that excellent culture medium, the micro-organisms grow in number probably and invade dentin and enamel (Fig. 14). Now we can explain the shadows (c) of Figure 23. In frontal caries, the acid-forming micro-organisms form the spearhead. As soon as they reach the dentino-enamel junction, they find better living conditions, multiply and produce more acid. Thus the dentin becomes more decalcified than one would expect judging from the decalcification of the enamel. The dentin shrinks and the created vacuum is filled with the dental lymph circulating in that area. A vacuum is created in every case where the overlaying enamel closes the space tightly and keeps air or saliva from entering. The shadows in the dentin of the upper premolars (c) are not carious cavities, but decalcified dentin. The center of the shadow contains not even decalcified dentin. It shrunk away and the vacuum was filled with dental lymph.

In the ground section of Figure 12, the lymph has apparently escaped during grinding or the space was filled with the saliva entering the neighborhood. In other similar ground sections, the space is filled with an amorphous yellow material, apparently coagulated, infected lymph. The border lines of this space are smooth in the beginning in both enamel and dentin (Fig. 12). In the decalcified section (Fig. 13), the borderline of the dentin is smooth except for the invading clefts at the apical end of the lymph accumulation. The situation in the enamel is demonstrated by the configuration of the accumulated lymph bordering the dissolved enamel. Threads extending in the empty enamel space indicate a beginning invasion also in this direction. In Figure 14, on each side of the coagulated lymph, an extension is invading the dentin as well as the enamel. The invasion of enamel and dentin, finally leading to necrosis of these tissues, marks the ultimate stages of caries development.

Here we encounter a similar problem, which was discussed in the literature some time ago, concerning undermining enamel caries found on x-ray examination of ground sections. Acid action was found in the deeper layers of the enamel, while the harder superficial layer, under the grenz rays, was intact. Penetrating acid from the surface cannot pass a higher calcified layer leaving it intact and initiate decalcification in a deeper layer. In our roentgenograms, we found too a layer of apparently intact enamel over dentin which has been acted upon extensively by acid. In both cases, the source is not acid penetrating from the enamel surface. In that case, no acid soluble material could remain intact beyond the affected layer. The harder enamel surface allowed only a small number of acid-producing micro-organisms to penetrate the deeper layer. Here, they found less calcification and better living conditions, multiplied and produced more acid, and the result of its action is evident under the grenz rays, while the harder layer at the surface appears intact. The same applies to the small number of micro-organisms that succeeded in reaching the dentin. Here, they grow in number and the result of their acid activity is greater than in the enamel.

The extent of decalcification and shrinkage of the dentin, caused by acid action, differs greatly in different teeth

and is by no means in proportion to the yellow pigmentation present. We may find the most peculiar combinations in ground sections. Sometimes, we encounter considerable shrinkage with only traces of yellow pigmentation. In other teeth, we may find considerable yellow pigmentation with no or only traces of shrinkage (Figs. 9, 10, 11 and 12). That the signs of acid action and the yellow pigmentation are also separated in the enamel has been indicated. This suggests the involvement of two different groups of micro-organisms and the improbability that acid and the yellow pigment are produced by the same micro-organisms. As long as there is not more bacterial knowledge available, we are confined to suggestions.

Undermining caries is possible only where bordering tissues have different degrees of resistance to the invasion of micro-organisms. At the borderline of enamel and dentin or of enamel and cementum, we find that enamel, being highly calcified, is more resistant to the invasion of micro-organisms than are dentin and cementum, which are far less calcified. This shows again that caries is a bacterial invasion, affecting rather tissues with a greater organic content. This is also the reason that the enamel lamellae, running as organic strands through the enamel, play such an important rôle in spreading dental caries. In the homogeneous tissue of the root, we find only the form of frontal attack of caries. There is no possibility of developing undermining caries.

In the pulpless tooth, the lymph circulation at the dentino-enamel junction has been shown to be present in a small degree. As yet, no information could be made available as to how the vacuum produced by the described shrinkage of dentin acts in such cases.

Thus, we have two kinds of undermining dentin caries, corresponding to the supposed two groups of micro-organisms which cooperate in producing caries. The main group producing caries proper, characterized by yellow pigmentation, is apparently a proteolytic one. It progresses quickly along the lamellae and spreads in the dentin, undermining the enamel (Fig. 9). The acid-producing micro-organisms remain behind. The acid production is indicated late in the x-ray picture. The second group is the acidogenic one accompanying the other. It progresses better along the prism sheaths, forming here the spearhead. Reaching the dentin, it produces shrinkage by decalcifying the dentin. That is the second kind of undermining caries which is easily evident in the x-ray picture. We may find yellow pigmentation in the dentin, while no sign of acid action has yet reached the dentino-enamel junction, but we could never detect an acid action on enamel-covered dentin in a ground section without at least a trace of yellow pigmentation in the dentin.

If the presence of acid causes shrinkage of dentin in an area of thick enamel which closes the space tightly to the mouth, the vacuum produced draws out the dental lymph. Only the x-rays can reveal such a situation. On the thin enamel edge at the cemento-enamel junction, the result of shrinkage is different. The shrinkage of the dentin opens a wedge-shaped space which is in communication with the mouth cavity. The thin enamel margin hangs free, having lost its dentinal support, and breaks off easily (Figs. 16, 17 and 18).

We find a similar condition in teeth containing fluorine. Here, the chipping off of the enamel or its brittleness is due to different conditions. The calcified parts of the enamel are supposed to be cemented together by the organic threads of the prism sheaths and the enamel fixed to the dentin by the tufts. In enamel exposed to fluorine during development, some of these structures are often calcified too, showing as strips of transparent enamel. That is probably partly responsible for the greater resistance to

dental caries of enamel exposed to fluorine. On the other hand, the cementing of the calcified parts becomes poor and the enamel becomes brittle. In severe cases, the presence of fluorine causes a chipping off of the enamel from the dentin. At the thin enamel borders, pieces break off easily.

In Figure 19, there is further evidence for the suggestion that the organic matter of the enamel is cementing the inorganic parts to each other. On the right side, we find more opaqueness (b-b) than on the left side. More opaqueness means more organic matter. The surface of the enamel on the right side is intact. On the left side, the enamel is more transparent and no place shows a smooth surface. That the breaks at that surface may have occurred before extraction or during grinding is unimportant. Studies of teeth exposed to fluorine have reported repeatedly that the enamel is brittle. If these breaks occurred during grinding, the transparent enamel was more brittle than the opaque, the two having been subjected to the same grinding procedure.

Let us now discuss the clinical application of this knowledge of pathology and the added suggestions. Some topics have already been discussed. If we encounter an extended brownish area at the enamel surface, an extended invasion of micro-organisms along the prism sheaths is indicated. Here, the x-rays are useful. Decalcification and shrinkage of the dentin are indicated by shadows at the dentino-enamel junction soon after the area is reached by the spearheading acid producers. We are not supposed to postpone cavity preparation. A shadow limited to the enamel is no indication for cavity preparation. It might be an arrested enamel caries. We have, however, to bear in mind that the carious process might have reached the dentin by way of a lamella (Fig. 9), yellow pigmentation indicating the spearhead. Here, we have no means of determining the actual condition. Repeated checking in the following period is advisable. If, during the following control period, no change develops, we may consider the case as one of arrested enamel caries. If the enamel shadow increases and reaches the dentin, we must start cavity preparation. We can more easily make the diagnosis of arrested enamel caries in older patients than in younger ones. The x-rays indicate a component of the carious process which may accompany the process proper to a varying degree. This component is valuable for diagnostic purposes. A knowledge of pathology may help one to use it better.

Another problem of clinical importance faces us when a belt of brownish enamel runs near the gingival margin along a considerable portion of the circumference of a tooth (Figs. 6, 7). Sometimes, we are in doubt as to when we should start cavity preparation. Some times, we have done so and have regretted it. The carious process in such cases is very shallow. We have not found a single ground section from such a case in which the caries reached the dentin if the enamel was thick enough. In cases of thicker enamel, it is advisable to polish eventual defective areas and impregnate.

We can explain why such a process is arrested. In Figures 1, 2 and 3, we saw that the carious process is stopped by transparent enamel serving as a barrier owing to its homogeneous calcification. In Figure 8, we have seen that transparent enamel can be produced by acid action. The beltlike developing caries is mostly preceded by chalky formation, which is a product of acid action. This formation erects a belt of transparent enamel, which serves as a barrier against further progress of caries, if it develops in the place of chalky enamel. Figure 7, which shows a part of the belt indicated in Figure 6, showed only chalky enamel. Two strips of transparent enamel developed. The result of acid action at

the thin enamel borders has already been discussed.

When the acid producers pave the way for the yellow pigment producers in thicker layers of enamel, progress might be checked, but if the yellow pigment producers are at hand from the beginning, the acid producers forming the spearhead might reach the dentin even in thick enamel. The production of a barrier in the presence of yellow pigment seems to be more difficult. It may be that the disintegration of the organic roads by the yellow pigment producers reduces the possibility of shifting calcium salts onto these roads as compared with areas where the acid can act undisturbed.

It is of practical importance to know that a chalky condition of the enamel is the product of acid action and is not caries as long as no brownish-yellow pigmentation appears. Some chalky spots turn brown. They are harmless, because the preceding acid action has taken care of the condition by forming a barrier of transparent enamel. Some chalky spots seem to disappear as time goes on, apparently being remineralized by some change of quality of the saliva. Beginning caries can never be checked by remineralization.

Acid action on extracted teeth is slowed considerably if tricalcium phosphate is added to the acid (Figs. 19 and 20).

It may be advisable to separate the discussion of the etiology and pathology of dental caries from that of prophylaxis. We now have three ways recommended for achieving caries prophylaxis. The first is reduction of carbohydrates in the diet, the second impregnation of the tooth surface with sodium fluoride solution. The third is impregnation with silver nitrate compounds. If a number of committees in different sections of the country were established with uniform directions for checking clinically these three possibilities and the reports were practically uniform, a method could be recommended to the dental profession, to the benefit of humanity.

SUMMARY

1. Caries is apparently a proteolytic process, progressing along organic roads and destroying them. It is characterized by brownish yellow pigmentation, which is present from the beginning.

2. Acid action, a component of the process, is present in most cases of dental caries. Decalcification, caused by an acid action, shows in the x-ray picture. Yellow pigmentation does not.

3. These two components are not present in all cases in the same proportion. Their location also varies considerably. Different groups of micro-organisms are apparently responsible for both components.

4. The yellow pigment-producing group proceeds better along the lamellae, undermining yellow pigmentation in the dentin resulting, while the acid producers may not have reached the dentin.

5. The acid producers proceed better along the prism sheaths, even in thick enamel, if the yellow pigment producers are present. By shrinkage of the dentin, they produce the second kind of undermining dentin caries, evident in the x-ray picture.

6. If the enamel closes tightly, shrinkage of the dentin creates a vacuum and dental lymph is drawn in. Advanced caries develops from this focus. Instant cavity preparation is indicated.

7. An extended brownish pigmentation on an intact enamel surface is no indication for cavity preparation if the dentin is roentgenologically intact. If continued x-ray examination reveals no change, the condition present is an arrested enamel caries.

8. An x-ray shadow in the enamel is no indication for cavity preparation; it can indicate arrested enamel caries. We cannot diagnose a defect in the enamel by x-rays alone, without examination with an explorer.

9. The necrotic tissue in a carious cavity indicates the final stage of the carious process. In the beginning, caries is indicated by the brownish yellow pigmentation of the tooth tissue in which all normal histologic characters are present.

10. A discolored, depressed point indicates an invasion of a lamella. Cavity preparation is justified even if the x-ray picture is negative.

11. The beltlike extending pigmentation along the gingival margin remains shallow, seldom reaching dentin in thicker enamel layers. Polishing and impregnation suffice.

12. Such caries develops mostly on a base of chalky enamel. This is a product of acid action, not caries. It produces almost regularly a barrier of transparent enamel, which stops bacterial invasion.

13. Soft enamel cannot be produced by acid action on extracted teeth. In caries, the removed calcium salts are apparently replaced by the bodies of the invading micro-organisms and thus the protein content of the enamel is enriched.

14. It is suggested that some element of saliva may continuously impregnate the tooth, blocking the invasion roads and producing natural immunity. Areas where the flow of saliva is impaired show a greater disposition to caries.

15. Chemicals which act to overcome the sensitivity of tooth surfaces are probably also useful in caries prophylaxis. The principles are the same: obstruction of open roads.

16. Dental caries can be produced in extracted teeth by keeping them in saliva. Caries is identified by yellow pigmentation in the ground section.

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MUCOUS MEMBRANE CHANGES AS SEEN IN ARMY CAMPS

JOSEPH L. BERNIER,* D.D.S., M.S., Temple, Texas

THE occurrence of oral diseases, both inflammatory and neoplastic, in members of the armed forces cannot be dismissed as unimportant. True, great strides have been made in their recognition and treatment, yet, even when diagnosed and treated early, they often represent loss of valuable training time. The number of inflammatory and neoplastic lesions occurring in the oral region is considerable. We need only to acknowledge this to admit that dentistry has a great responsibility; a responsibility that is being met in a highly satisfactory manner. I should like to present this paper, then, as a review of both the clinical and histologic features of those lesions, which seem to occur most often in the Army, and to consolidate the picture of such diseases in the minds of those who have not been in a position to observe large numbers of troops at first hand.

Oral inflammatory lesions, on both skin and mucous membrane, are of major importance in that many may have serious potentialities and offer difficulties in diagnosis. One need only mention some of the simpler surface lesions to emphasize this fact. As such, they are unimportant, yet the senile verruca, for instance, may appear, both clinically and histologically, much as the basal-cell carcinoma, and the cellular nevus may be the forerunner of the potentially malignant junction nevus. Correct analysis and diagnosis, therefore, are important.

*Lieutenant Colonel (DC) AUS (RA).

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INFLAMMATORY LESIONS

Leukoplakia.—Much has been written on the subject of leukoplakia.[1, 2, 3, 4, 5] Nothing more can be added at this time although statistics are being compiled which may add valuable information to the understanding of the disease. Because of its malignant potentialities and resistance to most forms of treatment, the treatment of leukoplakia in the Army is of great importance. Its similarity to other affections of the oral cavity undoubtedly accounts in part for this fact. The nodular, confluent type of lichen planus, for instance, may resemble leukoplakia to a marked degree. Histologically, they are easily differentiated. In the former, the acanthosis is not so severe, the keratosis is usually of the parakeratotic variety and the inflammatory exudate is high in the papillary layer of the corium. In leukoplakia, the acanthosis is more severe, usually resulting in a fusing of the rete pegs and a fraying of the basal layer, while the inflammatory exudate may extend well into the reticular layer.

The highly resistant forms of leukoplakia are often classified, histologically, as pseudo-epithelomatous hyperplasia. This is often considered as the premalignant form of leukoplakia rather than a true lesion, inasmuch as it appears closely allied to the squamous-cell carcinoma both clinically and histologically. This borderline lesion has been particularly prevalent in soldiers subject to

excessive wind, dust and actinic rays. These, according to Eisen and Lippincott, may act as carcinogenic agents. Further reference to this will be made in the discussion of the squamous-cell carcinoma. Deep ulceration is intense in the later stages of this lesion; whereas, in leukoplakia, there is often a piling up of surface keratin. Anaplasia, or cellular reversion, and dyskeratosis are common findings. This, then, is an obvious borderline malignancy, often diagnosed as persistent leukoplakia, but with a more serious prognosis.

Black Hairy Tongue.—Failure on the part of the soldier to practice adequate oral hygiene, particularly while in the field, has resulted in the appearance of numerous cases of black hairy tongue. This disease is the result of packing of food and other débris in the crevices of the tongue, with subsequent inflammatory changes producing a hyperplasia and hypertrophy of the filiform papillae. Weidman[6] has isolated a form of streptothrix which may be a contributing etiologic factor in the condition, and, to some extent, responsible for the black color imparted to the filimentous epithelial projections. Periodic cleansing by the patient is all that is usually required, the lesion disappearing in from two to three weeks. This condition should not be confused with black tongue due to vitamin B deficiency.

Herpetic Stomatitis.—Recently, considerable stress has been placed on a form of stomatitis characterized by the formation of herpetiform lesions on the oral and pharyngeal mucous membrane,[7, 8] and often associated with the lesions of herpes simplex. This disease, while occasionally noted, has presented no serious problems in most Army camps. Clinically, the affected mucous membrane is highly inflamed, this intense reaction being accompanied by a regional adenopathy. The vesicles appear either singly or in groups and show some tendency to coalesce. They burst spontaneously, leaving a highly inflamed bed, which ulcerates and becomes covered with a grayish pseudomembrane. Upper respiratory disturbances are often present. The clinical course, under treatment, averages two to three weeks. However, the adenopathy may persist longer.

Histologically, the inflammatory reaction is markedly severe in the papillary layer of the corium. The exudate is predominantly lymphocytic, with plasma cells and occasional granular leukocytes. The vesicles are entirely intra-epithelial, the virus, if present, being found in the fluid. Upon bursting, the liquid containing the virus spreads, causing a recurrence of the vesicle wherever the fluid comes in contact with the mucous membrane. Thus, the necessity of avoiding contact is obvious. Proper treatment is essential and is quite difficult. Ziskin and Holden[9] reported poor success with vitamin B, and also with vaccines, both formalized and autogenous. They had somewhat better success with daily topical application of 2 per cent gentian violet and, in two adult cases, good results with x-ray radiation as recommended by McCombs, Tuggle and Guion.[9]

Vincent's Stomatitis.—While the problem of Vincent's stomatitis has not been difficult in this present mobilization, it has been necessary to be constantly on the alert for its occurrence. It is undoubtedly true that many cases diagnosed as Vincent's stomatitis actually find their way into statistical literature, and yet represent only a severe gingivitis. This often results from improper interpretation of positive smears. It is seldom that this disease can be definitely diagnosed in the absence of the classical clinical picture and without all available laboratory aids. Indeed, there are investigators who believe, after critical analysis of available information, that there may be no true clinical entity such as Vincent's stomatitis. However, if

clinicians consistently recognize the broad group of gingival inflammations as Vincent's stomatitis, and attribute to them the usual contagious feature so often discussed, its importance as a public health problem becomes obvious. In spite of this, in large concentrations of troops both in field and in garrison, there has been no widespread occurrence of the disease. Under such conditions, many procedures become important, not the least of which is the constant search for isolated cases and their proper care. The many forms of treatment advocated and the widely divergent results further emphasize the lack of general understanding of this disease.

The histologic picture of Vincent's stomatitis is not in any sense specific. There is much necrosis, an almost constant secondary inflammatory reaction resulting in frank cellular destruction and complete loss of interstitial connective tissue. Masses of granular leukocytes are often noted, providing an intensely pyogenic membrane. It is easy to understand how organisms such as those found in the heterogeneous oral flora can flourish in such a nidus. Rationalizing in the treatment of Vincent's stomatitis is important. Those patients in the acute stage must be treated as toxic patients. This is necessary before any local treatment can be attempted. Patients should be hospitalized to provide better treatment, and to isolate the case. Topical application of aniline dyes, metaphen, chromic acid, etc., together with the administration of ascorbic acid and nicotinic acid, is of value.

Gangrenous Stomatitis (Non-Specific).—Numerous cases of a non-specific gangrenous stomatitis have been reported in various army camps, the lesions affecting the oral mucous membrane as well as the mucous membrane of other orifices. Hartley and Nelson,[10] in a report of twelve cases, have described the disease as a form of erythema multiforme. While it is similar in some respects, there are many factors to be considered before such a diagnosis can be accepted. The lesions, which are discrete and of varying size, show rather extensive ulceration. A frank membrane is not always present. The inner surface of the lips and cheeks, as well as the pharynx, is often affected, in addition to the buccal and lingual mucous membrane. There are usually much pain and general debilitation. Penile lesions are often noted, the entire glans penis being involved. Clinically, these are essentially the same as those described in the mouth.

Some of these cases have responded to vitamin B therapy. In others that I have seen, remarkable results were obtained by the discontinuance of all medication and the use of a bland, mild mouthwash. It would appear that this reaction is rather closely associated with dietary deficiencies. Oral smears are usually negative except for occasional fungoid forms, which are given little emphasis.

Hodgkin's Disease.—Because of its grave prognosis, and because of its prevalence in young males, this disease has been of great import. It is generally believed that it is essentially inflammatory, affecting the reticulo-endothelial[11] cell. Several forms are recognized, the sclerosing type, in which there is a marked fibrosis of the lymph nodes causing them to fuse into firm masses, and the sarcomatous variety, in which the reaction resembles a tumor and spreads to all parts of the body much as any other sarcoma. There is usually a marked eosinophilia with leukopenia and total disappearance of lymphocytes in the later stages. Pigmentation of the skin and a rash are often noted. Histologically, the disease is characterized by replacement of the node architecture by masses of lymphocytes and a sprinkling of large hyperchromatic endothelial cells with multilobed nuclei. These are the Sternberg-Reed cells. Eosinophils in rather large numbers are scattered throughout this background. The prog-

nosis of Hodgkin's disease is grave, and its diagnosis is accomplished only by careful clinical examination and histologic verification.

NEOPLASTIC LESIONS

With but few exceptions, all of the tumors occurring throughout the body may be found in or about the oral cavity. Some of these are quite rare and therefore of little consequence. Others, however, occur with some degree of regularity and have been of some concern in this present mobilization.

Fibroma.—Of importance is that group of tumors arising from fibrous tissue either in the submucosa or in the periosteum if peripheral, or from the endosteum if central.[12] The simple fibroma may be either soft or hard, according to its vascularity and collagen content. One must remember that superficial tumors arise from either the white or the yellow elastic fibers in the corium in contradistinction to those which are associated with the deeper fibrous tissue, which may be osteogenic or, in the case of the periodontal membrane, both osteogenic and cementogenic. Tumors usually duplicate in histogenesis their basic tissue. Thus, fibromas arising from the periodontal membrane may exhibit calcification, frank bone formation or cementum, or all three. In the last group, one must place the so-called epulis, more accurately described as an exuberant fibrous tissue, containing osteoclast-like giant cells. The hemosiderin content of this lesion is often striking, indicating a possible association with the elimination of local extravasation. In spite of the tendency of some authors[13] to consider this lesion as potentially malignant, i.e. locally invasive, an examination of hundreds of these tumors has failed to reveal histologically any frank malignant tendencies.

Those fibrous tumors arising centrally in the substance of bone are of greater concern. Remembering that the endosteum is essentially similar to the periosteum, it is easy to understand how tumors may arise in the substance of the bone which are histologically similar to the peripheral forms. An example is the central giant-cell tumor of bone, which is a counterpart of the peripheral giant-cell fibroma (so-called epulis). Removal of the former lesion is somewhat more difficult, but usually attended with success.

Neurofibroma.—Arising from the connective tissue coats of the nerve fiber are a group of tumors that are extremely complex, including the neurofibroma, or perineural fibroblastoma, which is believed to arise from the outer connective tissue coat; the neurilemmoma, arising compositely from all of the nerve sheathes, and the schwannoma, associated with the Schwann cell of the sheath of Schwann. These are important tumors in that they are not so rare as one is led to believe, and diagnosis is difficult, histologic examination being the only accurate method of determination.

The neurofibroma is characterized by spindly connective tissue cells arranged in a whorl, their nuclei being vesicular. Occasional isolated areas of basophilic cells, known as Verocay bodies, are often noted. The neurofibroma is encapsulated and often multiple. According to some investigators, it is similar to the multiple neurofibroma of von Recklinghausen's disease.[14] The neurilemmoma, while similar to the neurofibroma, has a tendency to be a single lesion, and is often more anaplastic. Palisading is more prominent, and the Verocay bodies are more numerous. The schwannoma is believed by many to be entirely epithelial, although this is difficult to believe because of the intimate association of the nerve sheaths. They are potentially locally invasive and offer definite problems in removal. A common site of occurrence is the palate, where they may be mistaken for the mixed tumor.

Mixed Tumor.—This tumor occurs both in the substance of the major sali-

vary glands and in association with the minor oral glands, as on the posterior palate. Although benign, it shows a marked tendency to recur because of the difficulty of removal. Histologically, the picture varies considerably, the basic elements being a fetal transitional epithelium and a pseudocartilaginous matrix of chondromucin. The epithelial elements are arranged in sheets or looping folds, and are usually hyperchromatic. Certain investigators consider this an epithelial lesion, even to the cartilaginous-like elements, which are described as representing a metaplastic process. They are usually poor in blood vessels, and assume extremely varied histologic patterns. Suspected lesions should always be examined histologically.

MALIGNANT NEOPLASTIC LESIONS

By far the most common malignant lesions of the oral regions are of epithelial origin. In discussing the forms of carcinoma that may occur in the oral regions, it is important to consider the difference between skin and mucous membrane, inasmuch as certain lesions commonly found on skin rarely occur on mucous membrane.

Skin, in addition to its appendages, differs in several ways from mucous membrane. The moistness of surface of the mucous membrane and its altered process of cell maturation are important examples. Just as the thickness of the stratum corneum varies on skin, so does it vary on mucous membrane. The epithelium covering the floor of the mouth, for example, shows considerably less cornification than that covering the buccal mucous membrane. This fact influences the nature of the tumors that may arise in these areas. The function of the normal squamous unit is to find its way eventually to the stratum corneum and produce keratin. This is important in the understanding of malignant changes occurring in the epithelium. The process of maturation of the squamous cell is a series of degenerative changes, occurring within the cell itself. As the basal cell migrates to the malpighian layer, it exhibits intracellular degenerative changes with the appearance of cytoplasmic inclusion bodies. These inclusion bodies become recognizable in the stratum granulosum as keratohyaline granules, staining deep blue with routine hematoxylin and eosin stains; an indication of a definitely alkaline background. In the stratum lucidum, seen only in certain areas of the body, the further transformation of these granules to eleiden, a fatty substance, is clearly evident. This layer stains bright red with sudan stains; an indication of a high percentage of free fat. This material is entirely lost as the cell reaches the stratum corneum and becomes keratinized.

Any serious disturbance or alteration in this process of maturation, resulting in a change in the orderly progression of the basal cell to the stratum corneum, may indicate malignant change. Such a disturbance is known as dyskeratosis, and may be a generalized process affecting the entire area of epithelium involved or may be confined to individual cell units. In the former instance, this disruption leads to the production of keratin, as "epithelial pearls" within the substance of the epithelium; in the latter instance, to the appearance of keratin globules within the cell itself. These globules are true keratin inclusion bodies, sometimes called round bodies and are characteristic of certain locally malignant forms of dermatitis, such as Bowen's disease and Darier's disease, or keratosis follicularis.

Basal-Cell Carcinoma.—The basal-cell carcinoma is essentialy a skin lesion, being rarely, if ever, encountered on mucous membrane. Its usual area of distribution is about the upper part of the face. Rarely, it may be found elsewhere on the body. Because of a broad usage of terms, there is much confusion concern-

ing the classification of this lesion. Certain investigators have considered it as a form of nevus. However, this is the exception rather than the rule. Krompecher recognized six distinct types, while Friboes grouped them in four. While further classification of this lesion leads only to confusion, there are certain varieties of the lesion that are clearly definable. The Krompecher type, probably the most common, is characterized by large islands or strands of deeply staining basal cells lying free in the upper dermis, occasionally exhibiting definite connection with the surface epithelium. Anaplasia is prominent, and because of their packed appearance, the cells appear spindly. Melanin pigment is often noted. Inflammatory change, while occasionally noted, is not a usual finding.

In the next group are the tricho-epithelioma and the epithelioma adenoides cysticum. These are often spoken of collectively as the Brooke type of lesion. Clinically, they are smaller lesions, and are more often seen in younger persons; hence, the waning belief that they are congenital. They are pink or mulberry colored and often multiple. There is some evidence of an origin in hair follicle epithelium. The cells are clear, round and hyperchromatic. Initially, they assume a rosette pattern and are located in the papillary layer of the corium. As the cells multiply, the clumps and cords grow together, isolating areas of connective tissue. These areas eventually exhibit central degeneration, with the production of an amorphous colloid-like material, believed by some to represent an abortive attempt at keratin formation. It is this cystic feature that identifies the lesion. It is comparatively benign, exhibiting minimal surface ulceration.

In the last group, we may place all those lesions representing a transition between the two types just described. The lesions in this group are characterized by slow growth and deep surface ulceration. Histologically, we find the essential changes described above, but not so pronounced.

Generally speaking, we may consider the basal-cell carcinoma as a benign surface lesion arising from the basal unit of the stratified squamous epithelium, before the cell has exhibited a degenerative maturation sufficient to place it in the category of the true squamous cell. That no keratin is produced further bears this out. The lesion is radiosensitive and easily removed by a simple surgical procedure. This lesion, for practical purposes, does not metastasize, only three such cases having been reported in the literature.

Squamous-Cell Carcinoma.—The squamous-cell carcinoma, arising after the basal cell has differentiated to the squamous unit, may occur on either skin or mucous membrane, and shows a marked tendency to occur at mucocutaneous junctions. It is commonly seen on the lower lip, seldom on the upper. Its degree of malignancy will vary in different areas of the mouth, those lesions affecting the tongue and floor of the mouth being more malignant. Clinically, it is a variable lesion, sometimes being flat and scaly with central ulceration, and at other times definitely papillary or rugose in character. On certain mucous surfaces, it is often an irregular ulcer with little or no keratin, while those lesions that may follow in the wake of leukoplakia exhibit more cornification. A high percentage of the skin lesions seem to follow the presence of senile keratosis, while, on mucous membrane, leukoplakia may be initially noted. This has led to much speculation as to the precancerous nature of these two lesions. From a purely histologic standpoint, it seems reasonable to assume that such lesions may break through their retaining basal membrane, thus becoming frankly malignant. Biopsy should therefore always be resorted to in order to properly classify the type and degree of change.

The malignancy of the squamous-cell carcinoma will vary according to the degree of differentiation attained by the squamous-cell at the time of neoplasia. Indeed, this is the system of grading devised and used so effectively by the Broders.[15] The adult function of the squamous cell being to produce keratin in neoplasia, if we can determine the degree of cellular differentiation and the amount of keratin produced we then have a fair idea as to the degree of malignancy of the lesion. As it matures, the cell differentiates beyond the point of reproduction, and, if of the squamous variety, produces more and more keratin. Therefore, less malignant lesions will contain a higher percentage of adult cells, and will show only a slight degree of mitotic activity, with much keratin production. In other words, this lesion is growing slowly and consists of adult cells, many of which are producing keratin. The more malignant forms, on the other hand, contain a higher percentage of undifferentiated cells, which are multiplying rapidly and producing little keratin. Most of the cells in the latter type do not attain any of their adult characteristics; therefore, mitotic activity will be greater. This, then, is one basis upon which one may attempt the grading of carcinoma.

Histologically, the squamous-cell carcinoma exhibits properties of invasion, the cells growing in strands and cords that invade the underlying connective tissue. Mitotic figures not only may be numerous, but are also often bizarre and abnormal. Attending this process, there is usually much chronic inflammatory exudate. This tends to further increase the activity of the epithelium, causing it to send finger-like projections into the corium. This is the process of pseudo-epitheliomatous hyperplasia, described previously.

Recently, a surprisingly high percentage of lip lesions have been noted in soldiers from the southwestern part of the United States. These, like the border-line pseudo-epitheliomatous hyperplasia, seem to follow dryness and cracking of the lips after exposure to intense sunlight, wind and dust. Minor abrasions of the lips are often noted as preceding the lesion. Such abrasions often heal, only to break down later, producing a crater-like ulcer, following which there is rapid involvement of the regional nodes. On the other hand, extensive leukoplakic involvement of the mucosa may, over a long period of time, become clinically malignant, the patient becoming progressively cachetic with terminal metastatic lesions.

Lesions involving the cheeks, while not common, are occasionally noted. Perforation of the cheek with involvement of the salivary glands is usual. These lesions are often malignant. Carcinoma of the tongue and floor of the mouth are definitely of the more malignant type, owing to the scarcity of keratin normally produced in these areas. A painful chronic glossitis usually precedes these lesions. In the absence of this symptom, the lesion may attain a large size before being noticed, pain and difficulty in swallowing being the first hint of its presence. Metastatic lesions occasionally affect the mandible, the primary lesion usually being, according to Geschickter and Copeland,[16] in the thyroid or prostate glands.

Transitional-Cell Carcinoma.—Because of their recent high incidence in young males, reference to the transitional-cell carcinoma or lympho-epithelioma is indicated. These lesions arise from the peculiar lympho-epithelial association so notable in the pharynx. They are often found in the pharyngeal tonsils, where they may be overlooked. Clinically, they show little tendency to ulcerate and are remarkably radiosensitive. They arise essentially from respiratory epithelium, but are greatly influenced by the presence of lymphoid tissue. In spite of this complex background,

they tend to retain, to a marked degree, their basal or germinal characteristics. The cells are small, hyperchromatic and of uniform appearance. Their nuclei are fairly large, consistently positioned and active. Mitotic figures as such are not numerous. The cells are arranged either in the long looping strands of the Regaud type or in diffuse sheets of the Schminke variation. Metaplasia toward the squamous type is often noted, particularly in those arising within the maxillary sinus.

CONCLUSION

It is obvious that in any discussion of oral lesions as seen in members of the armed forces, one might merely refer to any standard text on oral diseases; for, at one time or another, practically all such diseases may be encountered. The number of local and generalized infectious processes arising from general oral sepsis, together with the fact that many dermatoses, such as pemphigus, and lichen planus, may affect the mucous membrane, makes the rôle of the dentist as a diagnostician important. It is not important that he make a definite diagnosis in each instance, but it is important that he be able to recognize pathologic entities, and to determine whether the treatment is within the realm of his practice. Certain of the lesions encountered are a definite dental problem and are best treated by the dentist. A simple ulceration resulting from local irritation falls within this group. One must realize, however, that such innocent lesions may develop serious complications. It is important that these changes be recognized and that the patient be referred to the specialist when they occur.

Direct smears of specific oral lesions may tend to confuse the true histologic picture because of the tendency to misinterpret the importance of secondary contaminants. Non-specific inflammatory lesions are, of course, less easily evaluated in this manner. Serologic examination may be of value, but is not altogether effective in every instance. Certainly, clinical examination alone cannot be accepted as a reliable means of diagnosis. Obviously, then, the biopsy is the only reasonably accurate diagnostic aid available to the operator, provided it is properly interpreted.

There is a widespread belief that the dangers incident to biopsy are sufficient to make the procedure unsatisfactory. This is not the case. No one will deny that certain dangers attend the operation, but the value of the information obtained overshadows these questionable dangers. It is stated by some that biopsy may cause serious malignant changes within relatively low-grade quiescent tumors. This is possible, but actually of little importance, such changes being rarely demonstrated. Generally speaking, biopsy in the case of vascular malignant tumors, such as the sarcomas, which metastasize by way of the blood stream, may present some dangers. Certainly, any operative procedure on these tumors may injure or disturb the blood channels, thus increasing the possibility of metastasis. This is particularly true of the melanoma. Most of these possibilities are seldom noted, and one cannot disprove the value of the biopsy on them alone. It is only reasonable that whatever their seriousness may be, these dangers cannot be as great as the risk taken in attempting radical treatment or abandoning a patient to a hopeless prognosis without histologic proof of the true character of the lesion.

The Registry of Dental and Oral Pathology of the American Dental Association operated in conjunction with other registries at the Army Medical Museum, Washington, D. C., has become an important agency in assisting the dentist in the diagnosis and treatment of oral lesions. It has grown tremendously in the past few years, its services now being utilized by individuals and groups throughout the country. As a member of organized dentistry, one

is privileged to send material for examination, this making the biopsy service available to all ethical practicing dentists both in the armed forces and in civilian practice. It is earnestly suggested that those interested in this program write the Curator, Army Medical Museum, for complete information.

It is important for all of us to remember that, in this present mobilization, many problems are presented to the dental service. On the other hand, much valuable information is being obtained both by individuals and by the dental profession as a whole. The true value of this information will not be apparent until some time after the emergency. However, the ability of individual clinicians to meet and overcome the problem is evident in clinics in the many Army camps throughout the country. Those lesions which have been considered in this discussion represent those occurring most frequently, and they offer the greatest problems of diagnosis and treatment. It is obvious that these affections are quite different from those seen in the office of the average general practitioner or even specialist. However, we must realize that the problems of mobilization of large numbers of men in a fairly constant age group, living under rather difficult conditions, are very likely to produce a picture unlike that represented in civilian communities.

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McCloskey General Hospital.

GEOGRAPHIC VARIATIONS IN CARIES PREVALENCE IN SOLDIERS

ABRAHAM E. NIZEL,* D.M.D., and BASIL G. BIBBY,† Ph.D., D.M.D.

CLINICAL observation in the dental clinics at Camp Edwards indicated to one of us (A.E.N.) that caries was consistently more prevalent among the soldiers from certain parts of this country than among those from other parts. To substantiate this clinical impression, a statistical survey of defective (D) and missing (M) teeth of 22,117 soldiers was made. Unfortunately, information on past dental experience, which is indicated by filled (F) teeth, was not available from our records. It was realized before this study was undertaken that the DM values obtained would not represent the actual caries experience. However, we felt that it would represent a sufficiently reliable index of the general trend of caries prevalence to serve as the basis of studies of the type reported here.

The explanation of this geographic distribution is of paramount importance, for it might well be a key to the caries problem. In this paper, we present (1) a brief review of the investigations that have been made on this subject, (2) our data and (3) a consideration of possible correlations of climatic influences, and mineral deficiencies in soils, with caries experience. Our purpose is not to draw any final conclusions, but merely to bring to light certain facts for the purpose of stimulating others to more detailed investigation.

REVIEW OF THE LITERATURE

Our armed forces have served as the chief sources of epidemiologic studies of dental caries. As early as 1865, Lewis[1] noted that exemptions from military service on account of "loss of teeth" were greater in some areas than in others. New Englanders had the highest exemption rate, with a mean of 22.63 as compared with the Middle Atlantic States' rate of 20.12 and that of the East Central States' rate of 14.11.

Statistics from physical examinations[2] of draftees in World War I revealed a similar geographic distribution of "defective and deficient" teeth. The mean rate of rejection per thousand men was again highest in New England, 78.15. The other sections of the country showed the following rates of rejection: Middle Atlantic, 30.79; North Western, 19.86; East Central, 16.80; South Eastern, 16.25; South Western, 10.60; West Central, 10.32, and South Central, 4.62.

That a higher caries immunity existed in the South Central States than in the New England sector was shown by Ferguson,[3] who collected data on the DMF of 4,602 naval recruits. Although his results were not presented on a sectional basis, when calculated on such a basis they show for New England, 12.01; Middle Atlantic, 9.83; East Central, 7.83; West Central, 4.92; Southeastern, 3.46, and South Central, 3.46.

Further evidence may be found in a recent dental survey[4] on aviation cadets, which showed a high caries susceptibility of residents of North Eastern sections as compared with those of the South.

The consistent repetition of this same phenomenon over a period of eighty years eliminates all possibility of chance

*Major (DC), Army of U. S., Camp Edwards, Mass.

†Dean, Tufts Dental School, Boston, Mass.

and establishes the geographic variations in the prevalence of dental decay as a fact. It seems safe to say that this disease is to some extent endemic in character. As will be shown in the following pages, our statistical findings corroborate the evidence of all the other investigators.

SOURCE OF MATERIAL

Dental Data.—Our data were derived from random dental records of patients who were examined by dental officers at this station in a similar manner with the aid of mouth mirrors and explorers.

Our study group was limited to physically fit men between the ages of 18 and 45 who came from all walks of life. Such a group represents a highly selected sample and is not representative of the entire populace. The advantage of working with such a group is the elimination of such variables as sex, age and economics. Accordingly, the value of our correlations with geographic environmental factors is of greater significance.

The number of cases collected from the various states was calculated on a per capita basis. On the assumption that a ratio of from 1 : 5,000 to 1 : 10,000 to the total state population represented a very satisfactory sample, we attempted to collect the number of cases from each state which fell within that range. We were, in most states, able to obtain the desired number of cases, with the exception of Wyoming, Utah, Washington, Oregon, Nevada and California. The size of the samples of these states is shown in Table 1.

From each patient's dental record, the following information was extracted: (1) the state of nativity (which in more than 90 per cent of cases was the same as the one in which he had always lived), (2) the age and (3) the total number of defective and missing teeth. A total of thirty-two teeth was considered to be the full complement. The data on the condition of the teeth were compiled in the following manner: All carious teeth including the non-restorable ones were considered defective and were recorded in their respective age groups under column D of our data sheet. The missing teeth were recorded under column M. The four age groups considered were those 20 years and under; those from 21 to 25 inclusive; those from 26 to 30 inclusive, and those 31 and over.

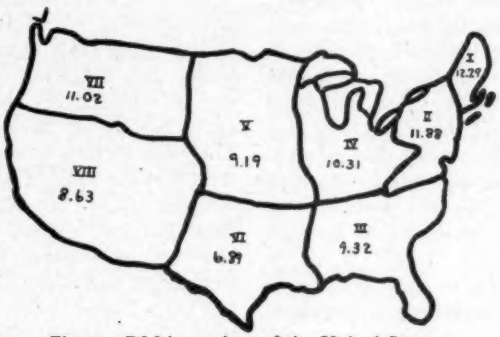

Fig. 1.—DM in sections of the United States.

Soil Data.—Dental caries experience in relation to the mineral composition of public water supplies has been extensively studied by Dean,[5] East[6] and others. In contrast to this, correlated studies between dental decay and min-

eral contents of soils are lacking. However, through the advice and aid of Mr. Kenneth Beeson, soil chemist for the United States Department of Agriculture, we were able to obtain some information on the mineral characteristics of the different soil regions in this country.

FINDINGS

The average DM value for all age groups from each state, the number of cases used and the ratio of the sample to the population are presented in Table 1, showing the marked variations in dental caries experience among soldiers from different states. In view of the fact that our findings are drawn from a homogeneous population, this epidemiologic phenomenon can be ascribed only to geographic environmental differences.

The environmental factor in which we were particularly interested was the soil. For that reason, we compared in greater detail states representative of different soil regions from which we were able to compile satisfactory population samples. To determine whether there were statistically significant differences between the caries prevalence in these states, means and standard errors were computed for each. These are presented in Table 2, which shows that the caries prevalence in Maine is significantly different from that in all other states. The same is true of Ohio. On the other hand, the DM of Tennessee is not significantly different from that of Georgia, South

Figure 2

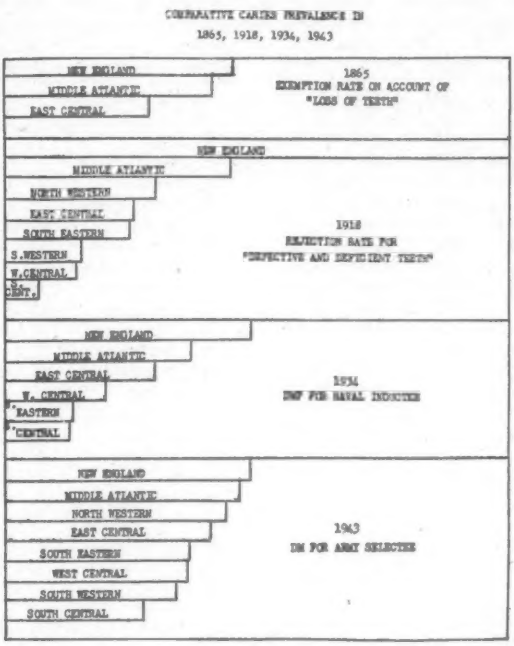

Figure 2.

Dakota, Iowa, Florida and Arkansas. This finding reemphasizes the marked caries prevalence in the New England and North Central states. It is interesting to note that caries is prevalent in podzol and gray-brown podzolic soil regions, and that wide variations in caries susceptibility occur in association with the red and yellow, chernozem and chestnut and prairie soil regions of the south and midwestern states.

more accurate value than if we had added the totals of defective and missing teeth of each state and divided by the number of the states in each sector. It is quite obvious from the data shown in Figure 1 that the New England and Middle Atlantic States show a significantly higher caries susceptibility than the southern states, particularly those in the south central area.

The consistent repetition of this re-

TABLE 1.—AVERAGE DM VALUES OF 22,117 SOLDIERS FROM FORTY-EIGHT STATES

DM Order	State	No. of Cases	Per Capita Ratio	DM Teeth	DM Order	State	No. of Cases	Per Capita Ratio	DM Teeth
1	Delaware	54	1/4,926	17.05	25	Kentucky	511	1/5,355	10.02
2	Maine	178	1/4,747	15.96	26	Georgia	627	1/4,974	9.99
3	Rhode Island	158	1/4,512	15.39	27	Utah	35	1/15,657	9.89
4	New York	2,671	1/5,009	13.88	28	South Dakota	129	1/4,969	9.64
5	Oregon	77	1/14,117	12.62	29	Iowa	433	1/5,877	9.31
6	New Jersey	942	1/4,403	12.43	30	South Carolina	294	1/6,480	9.23
7	New Hampshire	110	1/4,464	12.15	31	Louisiana	269	1/8,773	9.20
8	Massachusetts	864	1/4,991	12.06	32	Nebraska	242	1/5,425	9.14
9	Wisconsin	354	1/8,827	11.98	33	North Carolina	712	1/5,004	8.95
10	Ohio	1,266	1/5,441	11.70	34	Tennessee	585	1/4,976	8.95
11	Idaho	85	1/6,152	11.59	35	California	316	1/21,857	8.93
12	Washington	124	1/13,879	11.23	36	Mississippi	267	1/8,168	8.92
13	Vermont	85	1/4,223	11.00	37	Arizona	45	1/9,977	8.87
14	Connecticut	452	1/3,783	10.97	38	Montana	44	1/10,695	8.84
15	Maryland	359	1/5,044	10.62	39	Florida	251	1/7,517	8.79
16	Pennsylvania	2,201	1/4,498	10.46	40	Colorado	129	1/8,666	8.32
17	North Dakota	81	1/7,888	10.39	41	Virginia	521	1/5,111	8.31
18	Michigan	728	1/7,204	10.27	42	Nevada	3	1/35,555	7.90
19	Indiana	466	1/7,330	10.18	43	Kansas	238	1/7,474	7.81
20	Illinois	1,257	1/6,070	10.12	44	Arkansas	407	1/4,788	7.76
21	Missouri	414	1/9,118	10.11	45	New Mexico	62	1/8,516	7.67
22	Alabama	629	1/4,502	10.07	46	Oklahoma	309	1/7,553	7.37
23	Minnesota	283	1/9,841	10.06	47	Wyoming	23	1/12,590	6.69
24	West Virginia	335	1/5,701	10.05	48	Texas	1,492	1/4,301	6.44

For comparative purposes, we recalculated our DM data on the sectional basis shown in Figure 1. This calculation was weighted according to the number of cases represented in each state. For example, when we computed the DM for New England, Maine, which had a sample of 178 and a DM of 15.90, did not get so much weight as Massachusetts, which had a representation of 864 cases and a DM of 12.06. Thus, we obtain a

gional prevalence of dental caries is graphically portrayed in Figure 2. Here, we note that the curves of the 1865 draftee, the 1918 draftee, 1934 naval inductee and the 1943 selectee are almost all identical. This phenomenon was anticipated by East.[7]

Some incidental findings not particularly pertinent to the major purpose of this study might be noted. For example, a comparative distribution of protective

or restorative dentistry in the different sections of the country could be determined. Another interesting feature is shown in Table 3. Here, we note that the number of missing teeth becomes greater than the number of decayed teeth in the 26-30 age group. This is constant in all sections of the country.

EXAMINATION OF CORRELATIONS

The conclusion that caries prevalence follows a definite geographic pattern suggests the possibility of making correlations with geographic differences in the mineral content of regional soils and those[8] who feel that the effect of sunshine is of little importance. Our DM figures are correlated with data on water hardness and sunshine in Table 4.

Because there is record of deficiencies of soil minerals such as the iodides, causing goiter, and lack of phosphorus and calcium, producing rickets, and because no attention seems to have been paid to this possibility in the past, we were particularly interested in relationships between soil minerals and caries.

Actually, the mineral composition of the soil is influenced by a variety of facts, such as the climate, and in turn

TABLE 2.—SIGNIFICANCE OF DIFFERENCES OF DM MEANS FOR REPRESENTATIVE STATES

	Mean and Standard Error	Maine	Ohio	Georgia	South Dakota	Iowa	Tennessee	Florida	Arkansas
Maine	15.96±0.485		+	+	+	+	+	+	+
Ohio	11.70±0.058	+		+	+	+	+	+	+
Georgia	9.99±0.029	+	+		—	+	—	+	+
South Dakota	9.64±0.440	+	+	—		—	—	—	+
Iowa	9.31±0.029	+	+	+	—		—	—	+
Tennessee	8.95±0.72	+	+	—	—	—		—	—
Florida	8.79±0.39	+	+	+	—	—	—		—
Arkansas	7.76±0.27	+	+	+	+	+	—	?	
Soil types		Podzol	Gray-brown podzolic	Red and yellow	Chernozem and chestnut	Prairie	Red and yellow	Red and yellow	Red and yellow

+ Significant difference. — No significant difference.

water supplies or the conditions that influence them.

Both positive and negative relationships between hardness of water and caries prevalence have been reported by different investigators. Evidence has been offered[6] that users of "hard" water have less caries than those using "soft" water. It has been pointed out,[8] however, that this phenomenon is not the result of water hardness, but rather the presence of fluorides in the "hard" waters. Similar differences of opinion are found between those who believe that a reduction of dental caries is brought about by much sunshine[9] and affects directly the nature of the surface waters. Therefore, these other factors have to be considered when the soil is discussed.

Climate.—Under the influence of different ranges of humidity (rainfall), the mineral contents and the reaction of the soils will vary. For example, the high humidity of the Northeast, Northwest and Southeast leaches out much of the basic mineral and produces an acid soil. On the other hand, the semihumid and particularly the semiarid areas of the central and southwestern states have retained a high concentration of minerals and an alkaline pH.

Because sunshine is inversely related to rainfall and because of its evaporating effect on leaching soil waters, it indirectly affects soil composition. We have computed the mean annual hours of sunshine for our representative states. Table 4 gives a comparison of the caries experience figures from our data and mean annual hours of sunshine from Weather Map No. 13 of the U. S. Department of Commerce in representative states.

In the northern soil areas (Maine and Ohio), where caries susceptibility is greatest, there is comparatively little sunshine. Conversely, the southern sectors show long hours of sunshine and a lower caries prevalence. However, this correlation is by no means perfect.

Water.—Water supplies derive their minerals from soil solutions and, in turn, influence the fertility of the neighboring soils. Information on the relation of water hardness (calcium and magnesium carbonate content) to caries, therefore, is of interest both for its own sake and because of a probable parallel relationship to the mineral content of the soils. In Table 4, we have included a correlation between the DM value of our representative states and water hardness.[10]

Our chart seems to bear out the findings of those who feel that no relationship exists between dental decay and water hardness; for Maine, where caries is prevalent, has the same water hardness as Georgia, which shows a significantly higher resistance to caries.

Soils.—Modern food distribution is so varied that it is difficult to trace the mineral intake to any specific soil area. Nevertheless, excesses or deficiencies of certain minerals, such as iodine and selenium, in certain soil regions, have had detrimental effects on the health of the residents of such areas. It is not unreasonable to suspect that deficiencies in available calcium and phosphorus in the soil might adversely affect the teeth. Unfortunately, the data obtainable on the availability of minerals in the soil are not suitable for correlation with our data on dental conditions. However, we were able to obtain information on the percentage composition of calcium in the different soil regions. These data are presented in Table 4.

Analysis of these data indicates that differences in caries immunity are not explainable on the basis of increased calcium availability. As a matter of fact, the correlation between the DM and the percentage of calcium is 0.104. This means that no significance exists between the two facts. For example, Maine with a DM of 15.96 has a low calcium content in its soil, and Arkansas with a DM of 7.76 has an equally low calcium percentage in its soil.

However, the converse might be found when we associate caries with the in-

TABLE 3.—RELATIVE NUMBER OF DM TEETH AT DIFFERENT AGES

States	—20		21—25		26—30		31—	
	D	M	D	M	D	M	D	M
North Atlantic	6.65	4.46	6.05	5.79	6.02	7.59	5.27	10.11
South Atlantic	5.14	3.67	5.03	4.17	4.83	5.38	5.41	6.73
North Central	4.68	3.44	4.69	4.59	4.51	5.86	3.92	7.82
South Central	4.30	2.68	4.23	3.19	4.34	4.30	4.26	6.49
Far Western	3.71	3.46	4.03	4.02	3.57	4.69	3.69	8.36
Average	4.90	3.54	4.81	4.35	4.75	5.56	4.51	7.90

cidence of rare elements in the soils. For example, fluorides are found in abundance in certain forages of Arkansas[11] and in the blue grass area of Tennessee. Florida[12] soils are underlaid with phosphate rock, which is associated with a high fluorine content. The same states were found to have a low-caries index. More definite statistical data on percentage composition of fluorine in these soils are not available. Therefore, a correlation going beyond that based on the general observations of the agronomists cannot be made at this point.

That other rare elements might exert an equally important influence on caries is quite feasible. Boron[13] has of late been recognized as assuming a very important rôle in calcium metabolism and in the transportation and possibly utilization of carbohydrates. The evidence is strong that boron aids in the metabolism of other minerals. A known deficiency usually indicates that other elements will be lacking. Agronomists have noted areas deficient in this element along the North Atlantic and Mid-Atlantic seaboard. These are the caries-susceptible areas. It is also interesting to note that manganese, which has been associated with increased caries, is found in greatest quantities in acid soils, such as those of New England.

These generalizations can be established only by further investigation.

IMPRESSIONS

Increased caries prevalence in the New England and Middle Atlantic States is established. Identification of the contributing factors in this phenomenon should be sought not only in the water supplies, but also in the mineral composition of soils of these areas. This might be accomplished by a comparative analysis of soils from the relative caries-resistant areas of the South Central States and those from the caries-susceptible New England States.

From the data compiled and here examined, our preliminary impression is that factors other than an increase of calcium in the diet will decrease caries susceptibility. Perhaps other elements, which may influence the metabolism of calcium, such as fluorine or other unidentified rare elements, are important.

If fluorine concentration in water supplies reduces caries prevalence, optimal fluoride levels in the soils should exert the same influence. The low dental de-

TABLE 4.—RELATION OF CARIES PREVALENCE TO WATER HARDNESS,* SUNSHINE AND SOIL CALCIUM†

State	Decayed and Missing Teeth	Water Hardness Parts per Million	Mean Annual Hours of Sunshine	Calcium in Soil Per Cent
Maine	15.96	1— 60	2,200—2,400	0.27
Ohio	11.70	121—180	2,400—2,600	0.43
Georgia	9.99	1— 60	2,800	0.26
South Dakota	9.64	180	2,800	1.13
Iowa	9.31	180	2,600—2,800	0.61
Tennessee	8.95	61—120	2,400—2,800	0.26
Florida	8.79	121—180	2,800—3,000	0.26
Arkansas	7.76	61—120	2,800	0.26

*Weighted Average Hardness, by States, of Water Furnished in 1932 by Public Supply Systems, U. S. Geological Survey, Water-Supply Paper 658.

†Ross, W. A., and Beeson, K.C.: Problem of Principal Secondary Elements in High Analysis Fertilizer Mixtures. Am. Fertilizer, March 1939.

cay rate in Arkansas, Tennessee and Florida seems to bear out this contention. That the deficiency or excess of other rare elements besides fluorine might influence the incidence of dental decay is very feasible. Certainly, more detailed investigations in this phase are indicated.

Some support for the belief that caries susceptibility is correlated with the use of certain specific types of carbohydrates is found in an analysis by the Bureau of Home Economics,[13] which shows that carbohydrate-rich foods, such as sugars, preserves and potatoes, enter into the diets of residents of the northern caries-susceptible areas in greater quantities than in the southern ones.

It is our belief that an expansion of studies of the kind reported here offers one of the most promising approaches to a study of the cause of caries. This could most profitably be done by making a controlled study in two or more comparable counties, for example, Maine and Arkansas. The caries incidence in these communities should be determined. If possible, study groups should be restricted to diets of home-grown products to eliminate the variable of modern food distribution. A comparative analysis of the available minerals of the soils in these areas could then be made and correlations set up with caries prevalence.

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POSTOPERATIVE CONSIDERATIONS IN ORAL SURGERY

JULIUS F. MILLER,* D.D.S., Bainbridge, Md.

AT the United States Naval Training Center, Bainbridge, Md., a unique opportunity was presented to the Dental Division, under the direction of Capt. J. A. Walsh, to observe the postoperative effects of various surgical procedures in the mouth. These observations were made at just one of the dispensaries in the Stewards Mates School Area, in which are colored recruits drawn from all parts of the country.

Since naval personnel is predominantly men between the ages of 18 and 25, it appears that oral surgery constituted a great part of the treatment rendered at this particular dispensary.

The impressions presented are based on statistics of cases seen over a six-month period in this area, as shown in the accompanying table. Over this period, 1,928 patients were seen on whom a total of 4,205 surgical operations were undertaken. The observations made and the technics employed in the various procedures are presented with the hope that others may find them useful when confronted with similar situations.

One of the means by which postoperative pain can be lessened is greater care in the manner of injecting the anesthetic; or by reduction of the strength of the solution itself. Many operators feel that they can inject the anesthetic fluid in almost any area and in almost any dosage and strength. At times, the patient is very toxic. Within the operative field, there may be millions of bacteria, the virulence of which will not be decreased by the injection of an anesthetic, however mild it may be. Without a roentgenogram, one cannot determine whether there is an infected area in the bone. At times, there may be present an active infection that is not evident in the film. If an injection is made into the periosteum in which are millions of bacteria of a virulent nature, there will be greater postoperative irritation, and hence more pain.

Postoperative complications, such as severe hyperemia, inflammation, painful infiltration, sloughs and necrosis, are the result of infection, of the addition of an excessive amount of epinephrine or of the use of a hypertonic salt solution as the vehicle. These complications are not the result of the nature of the procaine itself. It should not be overlooked that the ischemia caused by the presence of epinephrine is intensified in the presence of procaine and, for this reason, the amount of epinephrine should be reduced to a minimum. It should be the rule not to inject epinephrine into tissues the vitality of which is already reduced, inasmuch as they recover very slowly, if at all, from the effects of this agent. Procaine has no cumulative effect, as it is rapidly destroyed in the liver. Any untoward symptoms develop increasingly after injection of the solution.

The question of having the manufacturer provide ampules containing prepared solutions of the local anesthetic has been favorably considered by the committee of the American Medical Association on local anesthetics. These

*Lieutenant (DC) (V-G) USNR.

ready-to-use solutions, with suprarenin, in hermetically sealed glass ampules, are stable, sterile, isotonic and very effective. They are in demand as they afford protection against avoidable accidents and do away with errors in the preparation and sterilization of the solution.

In consideration of the large number of teeth extracted, hemorrhage is not a very frequent complication, but it may be a serious or even fatal one. If undue hemorrhage occurs, the alveolus should be syringed out with a warm saline solution or any other mild antiseptic to dislodge any clots, as the presence of a large extravascular clot may favor bleeding. One is sometimes surprised, on cleaning the clots from a bleeding wound, to find that the flow soon ceases. Careful inspection should be made to determine the source of bleeding. Sometimes it comes from the gum margin, in which case the flow may be arrested by a suture through the gum on each side of the socket. If the bleeding comes from the depths of the socket, a little tannic acid powder, adrenalin chloride, styptase, vitamin K or even snake venom on gauze packed into the socket will frequently arrest the bleeding. Another agent very useful for this purpose is a tissue extract known as thromboplastin, with which the gauze packing is soaked. If use of this does not control the bleeding, two to four thicknesses of sterile gauze is laid over the surface of the packing and the adjacent gum, and the whole is covered with soft modeling compound, into which the patient bites. This should be sufficient in bulk to be in contact with the opposing gums or teeth when the jaws are closed. Before the compound is hard, the jaws are closed firmly and held together by a Barton bandage, or even by wiring the upper and lower jaws together. Measures should be instituted to increase the clotting time of the blood. The packing in the socket should not be disturbed for at least twenty-four hours.

CASES SEEN OVER A SIX-MONTHS PERIOD

Date	Patients	Extractions	Impactions	Retained Roots	Alveolectomies	Alveolar Abscesses	Cysts
September 1943	116	103	11	16	15	12	5
October 1943	109	191	50	29	14	22	6
November 1943	473	777	26	16	44	5	2[illegible]
December 1943	381	620	39	8	71	5	1[illegible]
January 1944	406	664	51	6	83	16	17
February 1944	443	979	52	35	154	5	16
Total	1,928	3,334	229	110	381	65	86

After hemorrhage has persisted for a time, the blood pressure falls. The general, and with it the local, pressure is lowered by the patient's lying down and by the administration of sedatives, but no stimulants. This condition of faintness resembles that often accompanying severe hemorrhage. To raise or stimulate a patient who has just fainted from loss of blood is to invite an increase in bleeding. The use of certain drugs, such as the nitrates, will lower the blood pressure, but is seldom advocated. The use of vasoconstrictor drugs as styptics,

which cause a general constriction of the blood vessels, has been condemned by some, on physiologic grounds. The administration of vasoconstrictors causes an elevation in blood pressure, which will outweigh the benefit derived from the relatively slight constriction of the blood vessels that occurs at one point.

Another postoperative consideration is the possibility of injecting the anesthetic solution into a muscle, because of either faulty technic or other conditions not under our control. If the solution should be deposited in the superior constrictor muscles of the pharynx, which is not unlikely, a retropharyngeal abscess, with various complications, may develop. On the other hand, the following is a very common occurrence: After the usual routine injection of blocking the mandibular nerve, the lower molars were extracted. Twelve to fifteen hours later, the patient noticed that his jaws would not completely open, a trismus of the muscles of the jaw probably resulting from an injection into this area. If this runs its usual course, the patient will regain full use of the mandible in about two to three weeks.

Sometimes, in addition to muscular infiltration, an infection ensues in the deeper tissues and may go on to suppuration. Cold packs on the outside of the face and warm irrigations intraorally are a great aid in this condition. The use of tongue depressors or chewing gum for stretching the jaws five minutes each day helps to stimulate the muscles and restore them to function.

The formation of a hematoma is due to the extravasation of blood into the interstices of the tissues. This may arise even though the proper technic is used. Oftentimes, it is due to an improper technic in a posterior-superior alveolar injection, from failure of proper retraction of soft tissues, with consequent puncture of small blood vessels and resultant swelling, rapidly increasing up to a certain point. The treatment usually is one of non-interference, although ice-caps and pressure bandage may be used.

There are many cases wherein prolonged numbness of the tongue and lower lip have persisted for from several days to several months, from severing or partially severing the lingual nerve in extracting the lower third molar; from severing the inferior alveolar nerve; from excessive curettage after extraction, or from injecting lingually in the third molar region. Nature will restore an injured nerve, and the nerve ends will even grow together again after it has been severed, provided the ends are not drawn apart, as can happen in surgical operations in soft tissues.

Oftentimes, with an injudicious injection technic, the needle inserted for a mandibular nerve block may strike bone on entering the tissues, and so bend and break. To hinder matters further, the patient moves, it being natural for him to fear the injection. It is advisable to remove a broken needle immediately. The needle itself, unless infected, does not do a great deal of damage to the tissues. The removal also may prevent edema or trismus. There are many means of removing the needle, but the most common one is an incision at right angles to the needle. To avoid all this difficulty, it is advisable to understand the anatomy of the part and how to keep the patient under control and to use the pen grip for control of the syringe.

Alcohol may be injected into the tissues as a result of improper sterilization or improper washing of the syringe. The conditions resulting in these cases are usually paresthesia of the nerve, numbness and loss of orientation of the tongue. The effect obtained here does not wear off as in a normal injection of a local anesthetic, but it is prolonged. The patient is disturbed and anxious, and has to be reassured. The effect may last from six months to a year.

There are certain conditions which,

fortunately, we do not meet often in our procedures; however, as they may occur, I believe some mention should be made of them. Among them is a condition known as surgical fever, which is a generalized infection occurring after injury or operation and due to the absorption of fibrin ferment from the seat of the injury. There is no evidence of infection in the wound and the patient feels well. There is a rise of temperature, sometimes to 103, beginning on the evening of operation or injury and lasting from twenty-four to forty-eight hours.

There is another type of surgical fever coming under the general heading of septic surgical fever. In it are three conditions which are due to the dissemination of bacteria and products of infection through the blood stream.

The first, called sapremia, is a constitutional disorder due to chemical poisoning from the products of a saprophytic bacteria, these products having been absorbed from the wound. It is usually the result of putrefaction of a mass of dead material in a wound, such as a blood clot or decomposing organic material on a dressing. The prognosis in these cases is very favorable, if the cause is removed early. The treatment is to clean out the putrifying blood clot and other material, taking care not to injure any of the surrounding area, and inserting about 7.5 grains of sulfathiazole. Rest and proper diet and elimination are important.

The second type, called septicemia, is caused by the action of living organisms that have gained entrance into the body and are undergoing growth and multiplication there. The organisims that produce these poisons in the body, called pyrogenic cocci, are absorbed from the wound into the surrounding tissues and into the blood stream, where they grow and liberate toxins. Accompanying the rapid rise of temperature, there is usually a marked leukocytosis. The area around the wound is red, swollen and tender. The prognosis is grave and oftentimes the condition is fatal. The general treatment is usually thorough cleaning out of the wound, use of sulfathiazole powder and, oftentimes, the use of various antitoxins.

The third condition, a general sepsis, is called pyemia. This is produced by infection from the wound, which is carried to distant parts of the body by means of small infected blood clots, septic emboli floating in the blood stream. Whenever such a clot lodges, a new focus of infection may occur. Ultimately, a pyemia may cause numerous localized infections in many parts of the body, with the production of metastatic abscesses. For example, a case of osteomyelitis of the mandible may be followed by pyemia, with secondary foci in the lungs, peritoneum and joints. These in turn give rise to special symptoms according to the individual organ affected. This is fatal, particularly when vital organs are involved in secondary abscess formation. The treatment here is one of thoroughly cleaning and draining the wound and the use of the sulfonamides. Morphine is often necessary to relieve the pain. Secondary abscesses, if accessible, are also opened and drained.

All the care and even the closest adherence to rules governing local anesthesia cannot eliminate certain conditions entirely beyond the operator's control, and which may lead to more or less serious postoperative trouble that cannot be foreseen, even with a properly given anesthesia and careful surgical procedures. Under this heading falls the so-called "dry socket" or osteitis of the socket, or, more correctly, localized osteomyelitis. This is very rarely recognized immediately after extraction. To prevent complications and after-pain, it is advisable, in all cases of extractions, particularly if the tooth has been abscessed, not to let the patient rinse the

mouth or flush out the socket, but to place in the socket a crushed tablet of 7.5 grains of sulfathiazole and let the patient bite tightly on a wad of sterile gauze for ten minutes just after extraction. When dry socket has not been prevented and the condition has developed into a typical case accompanied by severe and continuous pain, the application of various medicaments, such as guaiacol and glycerin, powdered acetyl salicylic acid and "butyn" ointment, often help after irrigation with warm saline solution or surgical solution of chlorinated soda until healthy granulation covers exposed nerve endings.

After-pain and swelling may be caused by the operative procedures themselves. Trauma is injury. Swelling is the result of trauma, resulting from an infusion of watery liquids into connective tissue. It may be accompanied by or be devoid of pain. It is evident that many cases of after-pain can be traced to faulty surgical intervention. These can be listed as caused by excessive trauma, inflammation of the alveolus following difficult extraction, leaving an apex of a tooth in the socket or the presence of broken external or internal pieces of alveolar process and pieces of broken septum after extraction, sloughing of the margins of the wound, insufficient hemorrhage and clot formation after excessive ischemia, infection from unclean instruments, from the patient's touching the wound with septic fingers, food débris or undue pressure on the mandible causing muscle pull; all of which can be prevented by precautionary measures. At the conclusion of an operation, it is advisable to direct the recruits, on their return to the barracks, to apply cold to the outside of the face for at least one hour, employing hot packs in cases of prolonged anesthesia with increased danger of infection and a dry socket due to prolonged anemia. Ultraviolet rays are very beneficial in cases of trismus or infection to stimulate the flow of blood to the part affected.

In this type of paper, there are two conditions that should be mentioned and differentiated: shock and syncope. The latter is a partial or complete temporary suspension of the functions of respiration and circulation leading to cerebral anemia. Shock is a sudden and grave systemic depression produced by operation, accident or strong emotion due to a profound action on the nervous system. Psychic shock is produced by abnormal impressions transmitted to the brain centers, bringing about a state of syncope. Traumatic shock is due to sudden trauma or injury. It may be due to a prick of the needle in dense tissue or in the periosteum, or too rapid injection.

Local anesthesia eliminates physical pain, but not psychic pain. Therefore, the operator should be on guard at all times, using diplomacy and tact, and always winning the confidence of the patient before operating or injecting. Every precaution should be taken to avoid psychic shock, and the operator should handle the tissues carefully, bearing in mind that delicate performance of technic is essential and that thoroughness should never be sacrificed for speed.

U. S. Naval Training Center.

SAVING TEETH AMONG HOME OFFICE EMPLOYES OF THE METROPOLITAN LIFE INSURANCE COMPANY*

JAMES M. DUNNING,† D.D.S., New York, N. Y., and
HENRY KLEIN,‡ D.D.S., Bethesda, Md.

ATTENTION throughout the country is now being directed toward the advantages of dental care for industrial workers. The adoption by the American Dental Association of a set of standards for such services[1] highlights the expanding interest in this field. The immediate benefits, most commonly recognized, of rendering industrial dental service are better work-attendance, increased efficiency and improvement in the health and goodwill of the employe. These are all difficult to measure in a quantitative way, yet few employers or dentists would deny their importance.

The basic and more immediate aim of such an industrial dental service as that recommended by the American Dental Association is prevention of tooth loss and other deleterious consequences of dental neglect. Aside from the strictly industrial matters of hazard abatement and treatment of work-connected injuries, strong emphasis is placed on the dental examination procedure, the recording system and the referral of workers to private practitioners or community resources for early treatment of all defects found at the initial mouth examination. Such preventive control of the ravages of dental disease implies a long range program, and good results can hardly be expected unless workers come under its influence at a fairly early age, and thereafter receive a systematic year-after-year dental maintenance service. That kind of control in present-day dental practice actually means continuous attention over practically the whole work life span of the worker to such small details as brushing the teeth and having dental cavities filled. Periods of dental neglect create arrears of damage not easily surmounted, if indeed they are ever overcome.

The dental service of the Metropolitan Life Insurance Company, started in 1915 by Thaddeus P. Hyatt, is one of the oldest industrial dental services in the United States. It has centered its efforts on preventive methods. A careful record has been kept of each employe through most of the existence of the program. Up to 1943, every home office worker was called semi-annually to the dental clinic for dental prophylaxis and examination. (A wartime schedule of one annual call now prevails.) Those who wish to go to their own dentists for this service are permitted to do so, but they are required to bring back an examination form completed by their own dentist. Eighty per cent or more of the Metropolitan employes have elected to have the examination made in the home office dental clinic. Roentgenograms are taken whenever indicated or requested, with-

*The opinions or assertions contained herein are the private ones of the writers and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large (Article 113, United States Navy Regulations).

†Lieutenant (DC) USNR; dental director, Metropolitan Life Insurance Company, on leave of absence.

‡Senior Dental Officer, Division of Public Health Methods, U. S. Public Health Service.

out charge to the worker. All employes are then referred to their own private dentists for treatment, or they are given assistance in finding outside private or institutional dental care. The employes are reminded every six months of the status of their teeth, and they are frequently instructed in the advantages of going to their dentists to have dental defects repaired. The home office clinic does not render any therapeutic service. It provides only prophylaxis, examination, diagnosis and education of the worker in the advantages of dental care.

As evidence of the amount of private care stimulated by the home office clinic, it was found in 1940 that home office employes were receiving 1,705 fillings and crowns per thousand population per year as against 1,079 fillings and crowns in the highest income group ($5,000 or more annual family income) reported by the Committee on Costs of Medical Care as analyzed by Collins.[2] In view of the economic status of the home office employes, it would not be unjustifiable to state that the normal rate of consumption of operative dental services had been doubled within the group as a result of the company dental service.

What are the results of these procedures? It is the purpose of the present report to describe some of them and to show particularly the extent to which the Metropolitan employes' teeth have been saved through the diagnostic and educational service rendered by the home office dental clinic. Data as to the dental status of the group are available through a study made by Hyatt of some 12,000 cases in 1927,[3] and more recently through a study of nearly 2,000 cases by us, with the assistance of Mr. Mortimer Spiegelman and Miss Grace Clinchy, D.H., of the company staff.

TABLE 1.—TOOTH MORBIDITY (DMF) AND TOOTH MORTALITY RATES* FOR HOME OFFICE EMPLOYES ON THE JOB IN THE YEAR 1942 AND FOR OTHER SPECIFIED POPULATION GROUPS; BY AGE

Age	Home Office Employes (1942)		School Children San Francisco		School Children New York City		School Children Hagerstown		NYA Males	
	Number of Teeth per Person									
	Missing	DMF	Missing	DMF	Missing	DMF	Missing	DMF	Missing	DMF
17			—	7.7	1.2	8.1	1.4	7.7		
18	2.0†	13.2†	—	8.3	1.3	8.5	2.0	8.7	1.9†	8.4†
19			—	—	—	—	2.9	9.3		
20-24	2.9	15.9	—	—	—	—	—	—	3.3	10.7
25-29	4.2	17.2	—	—	—	—	—	—	7.0	15.1
30-34	4.9	17.8	—	—	—	—	—	—	10.2	18.1
35-39	6.2	18.9	—	—	—	—	—	—	—	—

*Includes third molars, indicated extractions and edentulous conditions, in which tooth loss is counted as thirty-two teeth each.

†These figures are for ages 17 to 19 inclusive.

PREVALENCE OF DENTAL DISEASE AND TOOTH LOSS AMONG HOME OFFICE EMPLOYES AND OTHER POPULATION GROUPS

A first step in the assay of the material at hand involves comparison of the prevalence of dental disease among the Metropolitan employes with that shown by other population groups. Prevalence of dental morbidity is measured by counting the number of decayed, missing and filled (DMF) teeth (including indicated extractions), and expressing such counts in terms of a rate per person examined.[4]

Comparison in this regard for the

home office workers and other persons is shown in Table 1 and depicted in Figure 1. The material plotted in that figure for groups other than the home office employes were obtained from data given by Sloman and Sharp[5] and by one of us. (H.K.)[6, 7, 8] On the average, white persons 14 years of age show a tooth morbidity rate of about five DMF teeth per person. As age advances, teeth not previously involved are attacked. Such attack proceeds more or less consistently with increasing age, so that, at 22 years of age, age average fewer than eleven DMF teeth, while Metropolitan employes of comparable age average nearly sixteen DMF teeth. After 30 years of age, the differences in the DMF rate become smaller, until coincidence is reached; although it is to be recognized that the data for the oldest ages are insufficient to support a direct comparison. In general, it is reasonable to conclude that the home office employes in New York are characterized by DMF rates that are at least as high as or are higher than

TABLE 2.—TOOTH MORBIDITY (DMF) AND TOOTH MORTALITY RATES* AMONG HOME OFFICE EMPLOYES ON THE JOB IN THE YEAR 1927 AND FOR THOSE ON THE JOB IN THE YEAR 1942; BY AGE

Age Group	No. of Persons Year		No. of Teeth per Person Missing, Year		No. of Teeth per Person DMF, Year		Change per Person from 1927 to 1942	
	1927	1942	1927	1942	1927	1942	Missing	DMF
17-19	4,343	200	2.29	1.85	12.05	12.93	—0.44	+0.88
20-24	4,427	200	2.97	2.55	14.04	15.44	—0.42	+1.40
25-29	1,301	200	4.25	3.53	15.48	16.44	—0.72	+0.96
30-34	757	200	5.71	3.98	16.95	16.90	—1.73	—0.05
35-39	591	200	7.40	5.20	17.14	17.91	—2.20	+0.77
40-44	432	200	9.36	7.35	18.17	18.28	—2.01	+0.11
45-49	385	200	10.72	10.14	18.61	20.12	—0.58	+1.51
50-54	250	200	11.61	11.27	18.77	20.14	—0.34	+1.37
55-59	159	200	13.53	13.51	20.35	21.63	—0.02	+1.28
60-64	65	146	13.34	15.80	19.71	21.56	+2.46	+1.85
65 & over	43		15.70		21.09			
All ages							—0.60	+1.02

*Excludes third molars, but includes edentulous conditions, in which tooth loss is counted as twenty-eight teeth each. The missing teeth and the DMF teeth do not include indicated extractions, of which there are only a small number because of the high level of dental care received by the home office employes.

a person of the general population shows on the average more than ten DMF teeth. In contrast, the Metropolitan home office employes of comparable age show much higher DMF rates. For example, persons 17-18 years of age in Hagerstown, West Virginia and San Francisco, and high school pupils in New York, N. Y., average about eight DMF teeth; while the workers at the home office of the same age average more than thirteen DMF teeth per individual. Again, NYA youths in Hagerstown and West Virginia 20-24 years of those found in other large groups of white persons of comparable ages.

A final reason for believing that the Metropolitan DMF rates are high as compared with those of the country at large deals with the various compilations of regional differences in caries incidence, chief among which is East's[9] dealing with men of military age. These figures put New York State very near the top of the list for draft rejections on account of dental conditions both in the Civil War and in World War I. East also cites a study of naval recruits in

1935 wherein men from New York rate fifth from the highest in total DMF teeth.

As is indicated by the material shown in Figure 1, the Metropolitan group is unique in quite another respect; that is, the employes of the home office are characterized by exceedingly low tooth mortality rates. The prevalence of tooth loss is measured by counting missing teeth and indicated extractions and by expressing that count as a rate per person. Thus, at 18 years of age, white persons average about two lost permanent teeth. The employes of the home office also show about the same loss at a comparable age. That equality, however, is reached by the home office people in spite of a somewhat higher DMF tendency. Again, for the ages 20-24, the tooth loss rate among home office personnel is about equal to that found among other white persons of the same ages. Yet again that equality (in lost teeth) is achieved in spite of the fact that the home office people are attacked by dental disease at a rate about one and one half times as high as that of other available samples of white persons in the United States.

The saving of teeth among the Metropolitan employes becomes more and more pronounced as age advances. Thus, while a white person of Hagerstown or West Virginia 30-34 years of age has lost, on the average, more than thirteen teeth, the home office employe working in New York at the present time has lost, up to the same age, on the average, fewer than eight teeth.

TABLE 3.—TOOTH MORTALITY RATES* FOR HOME OFFICE EMPLOYES ON THE JOB IN THE YEAR 1942 AND FOR THE SPECIFIED POPULATION GROUPS; BY AGE

Age Groups	Tooth Mortality per Person: Home Office Employes	Family Income $3,000 or More per Year†	General Population All Incomes†
17-19	1.95	1.6‡	2.3‡
20-24	2.85	3.2	3.6
25-29	4.17	4.6	5.4
30-34	4.91	6.3	7.9
35-39	6.19	8.7	10.6
40-44	8.52	11.0	13.7
45-49	11.23	13.6	17.4
50-54	12.94	15.6	18.5
55-59	15.20	18.6	21.0
60-64	18.32	20.0	22.8
65 & over		22.4	23.8

*Includes third molars, indicated extractions and edentulous conditions, in which tooth loss is counted as thirty-two teeth each.

†The figures in these columns are derived from Table 5, Reference 10.

‡These figures are for ages 15-19 years.

TABLE 4.—TOOTH FATALITY RATE* AMONG HOME OFFICE EMPLOYES ON THE JOB IN THE YEAR 1927 AND FOR THOSE ON THE JOB IN THE YEAR 1942; BY AGE

Age Group	Tooth Fatality Rate: Year 1927	1942	Change 1927 to 1942
17-19	19.0	14.3	— 4.7
20-24	21.2	16.5	— 4.7
25-29	27.5	21.4	— 6.1
30-34	33.7	23.5	—10.2
35-39	43.2	29.0	—14.2
40-44	51.5	40.2	—11.3
45-49	57.6	50.4	— 7.2
50-54	61.9	56.0	— 5.9
55-59	66.5	62.5	— 4.0
60-64	67.7	73.3	+ 5.6
65 & over	74.4		

*Excludes third molars, but includes edentulous persons whose tooth loss is counted as 28 teeth per edentulous person. The "M" or missing tooth counts which form the numerator, and the DMF tooth counts which forms the denominator of the "tooth fatality rate" do not include indicated extractions, of which there are only a small number because of the level of dental care received by the home office employes.

DENTAL STATUS OF HOME OFFICE EMPLOYES AT THE PRESENT TIME AS CONTRASTED WITH THE DENTAL STATUS FIFTEEN YEARS AGO

It is of interest at this point to compare the dental status of the present employes of the company with that of a

similar group of Metropolitan workers examined fifteen years ago. Such a comparison provides a method for assaying the advantages gained over a decade and a half within the company *per se*. The two groups of employes (those of the year 1927 and those of the year 1942) are drawn from about the same general geographic area, and they have almost exactly the same age and sex compositions. They also have similar economic and occupational characteristics. Furthermore, approximately 75 per cent of the group employed now, in its older ages, is composed of persons who were in the employ of the company fifteen years ago. The dental status as of the year 1927 has been well described by Hyatt.[3] The entire group of records available at that time was studied, including edentulous cases. The group studied by the present authors was made up of home office workers employed as of the year 1942. Among the approximately 14,000 employes, 100 males and 100 females were selected at random from each five-year age group between 17 and 65 years of age, with the exception of the first age class (17-19), which is a three-year group, and the age class 60-65 years, in which only forty-six female cases could be found. Each age group, with minor exceptions, was adjusted so that it included clerical and manual workers, at a ratio of 85 to 15. This procedure was instituted in an effort to preserve an occupational ratio characteristic of the company as a whole, and of that of Hyatt's sample.

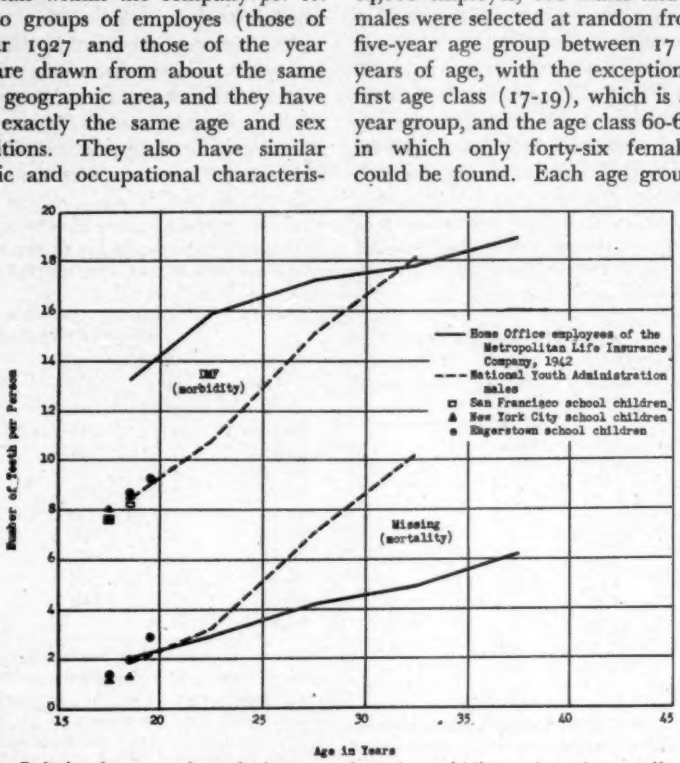
Number of Teeth per Person
Age in Years
DMF (morbidity)
Missing (mortality)
Home Office employees of the Metropolitan Life Insurance Company, 1942
National Youth Administration males
San Francisco school children
New York City school children
Hagerstown school children

Fig. 1.—Relation between chronologic age and tooth morbidity and tooth mortality for several population groups. The data are derived from examinations of (1) approximately 2,000 home office employes of the Metropolitan Life Insurance Company in 1942, (2) more than 1,300 high school children in San Francisco, (3) nearly 430 high school children in New York, N. Y., (4) more than 500 high school children in Hagerstown, Md., and (5) more than 1,400 youths from the National Youth Administration in Hagerstown and West Virginia. The data include findings on third molars, all indicated extractions and edentulous persons, whose tooth loss is counted as thirty-two teeth each.

The examinations upon which both

sets of data are based, those of Hyatt and ours, were made with the aid of dental mirrors and explorers. They were performed by dental hygienists and were supported by roentgenograms of all indicated areas, and by consultation with a dentist when necessary.

Two major comparisons are made here. The first deals with tooth morbidity (DMF teeth), the second with tooth mortality (loss of teeth). The data are given in Table 2. The contrast for

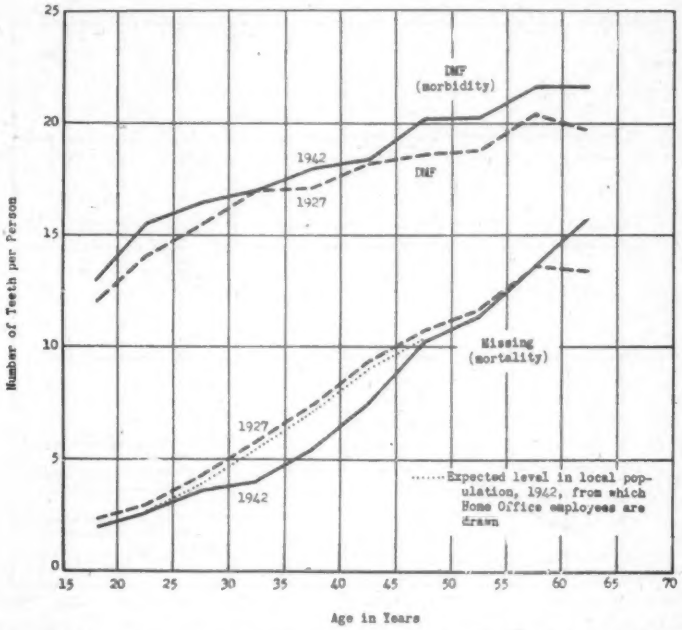

Fig. 2.—Relation between chronologic age and tooth morbidity and tooth mortality for home office employes of Metropolitan Life Insurance Company, 1942 and 1927. The data exclude third molars and indicated extractions, but include edentulous persons, whose tooth loss is counted as twenty-eight teeth each.

the two periods is shown graphically in Figure 2. As shown in the table and the graph, the DMF curve of the present home office employes runs consistently higher than that of the employes of fifteen years ago. The higher DMF rates now prevailing can be explained perhaps on the ground that the company now takes routine bitewing dental roentgenograms for all employes. The examination methods used at the home office clinic have changed very little over the past fifteen years, except for the bitewing x-ray examination. Thus, the higher DMF values now found among the workers of the company may indicate improvement in diagnosis or a higher susceptibility to dental disease, or both, but the larger probability lies in the direction of improved diagnostic technic. However, it is reasonably clear that the company's efforts to prevent the initiation of the new attacks of dental disease on teeth not previously attacked have not succeeded to any noticeable extent.

The second comparison concerns the lost-tooth rate found at the present time,

as contrasted with that characteristic fifteen years ago among the home office employes. From the material presented in Table 2 and Figure 2, it is apparent that the Metropolitan employes definitely keep their teeth longer than they did fifteen years ago. The younger age groups now have lost fewer teeth than was the case a decade and a half ago, and this favorable difference widens and becomes more pronounced in the middle ages, where two fewer teeth have been lost per employe than was the case in that shown by the present personnel. However, because of the small numbers of cases in the older age groups, a comparison here is not entirely warranted. In general, it is clear that the teeth of the present employes are lost at a significantly lower rate than was the case among home office people fifteen years ago. This finding is encountered in spite of the fact that the DMF. rates of the present personnel are at least as high as those of the employes of the earlier period.

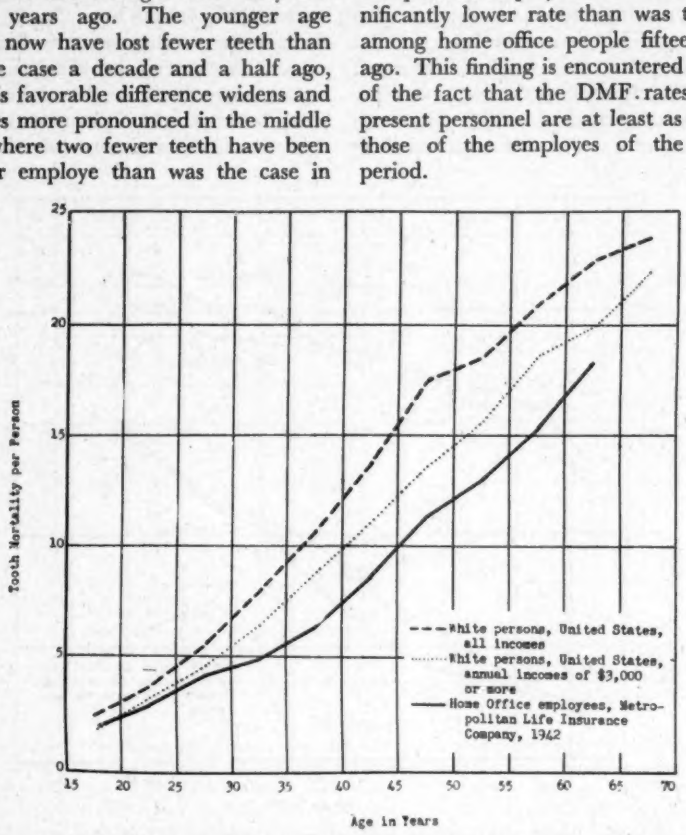

Fig. 3.—Relation between chronologic age and tooth mortality for home office employes of Metropolitan Life Insurance Company in 1942, white persons of all income classes in United States and white persons whose family income is $3,000 or more per year. The data include third molars, all indicated extractions and edentulous persons, whose tooth loss is counted as thirty-two teeth each.

the corresponding age, fifteen years ago. After the middle ages are passed, the two tooth mortality curves tend to coincide with indications that the teeth of the employes of the earlier period were lost perhaps at a slightly lower rate than

How much of this over-all decrease in missing teeth can the Metropolitan home office credit to its dental service? The decrease in the younger age groups of the present group of workers probably cannot be credited since those workers

have been under the influence of the Metropolitan service for only a short time. That decrease may be due to dental health educational practices characteristic of the community at large, particularly of the public school system in New York City. Moreover, since the year 1930, the company has required of all applicants for positions a high school education, and it may therefore draw its working force from a stratum of society somewhat more observant of dental health practices.

assume that the initial difference in tooth saving found among the younger age groups at the present time is not due to the influence of the clinic, but to other unidentified conditions operating in the community at large. Those conditions might well be applied to every age group of the present employes. Accordingly, the saving of teeth shown by the younger age groups, which averages a little less than one-half a tooth per person, was applied and credited to each age-group of home office employes, producing the dotted

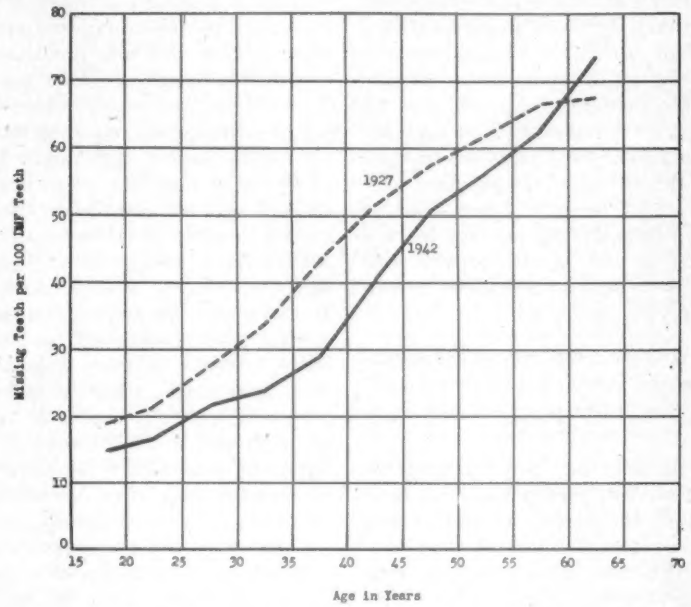

Fig. 4.—Relation between chronologic age and tooth fatality for home office employes of Metropolitan Life Insurance Company, 1942 and 1927 compared. The data exclude third molars and indicated extractions, but include edentulous persons, whose tooth loss is counted as twenty-eight teeth each.

To our knowledge, there are no other studies showing changes in tooth mortality rates over such a period as that under study here. Hence, there are available few data with which our material can be compared in terms of trends with time. However, for the purpose of the present analysis, we may

line in Figure 2. In spite of applying such a credit at each age, a net decrease over all ages of more than one-half a tooth per person remains. Actually, the Home Office clinic can claim a tooth saving average of about one and one-half teeth per person in the productive ages between 30 and 45 years.

It is of interest to note that the tooth mortality rate among the home office employes of fifteen years ago is *per se* very low when compared with rates for other persons of comparable age as shown in Figure 1. An exact comparison of the 1927 data with those shown in Figure 1 is not possible because indicated extractions have been omitted in the compilation of the 1927 material. It is clear, however, that even though the loss of teeth among the employes of fifteen years ago is higher than that of present employes, that loss (among the employes of 1927) considered alone was a good deal lower than is now the case among persons of the general population. It may be recalled that the dental service of the home office was started back in 1915 and made applicable to all employes in 1919, so that the effects of the program were felt for eight or more years prior to 1927, a sufficient time perhaps to have produced a low tooth-mortality rate among the employes examined in the year 1927.

TOOTH LOSS IN HOME OFFICE EMPLOYES AND THAT SHOWN BY A GROUP OF 45,000 WHITE ADULTS OF THE UNITED STATES

To reinforce the comparison of the data for the two periods 1927 and 1942, the figures for tooth mortality among the employes now on the job were compared with composite data on tooth mortality available from a study of more than 45,000 white adults, recently reported by one of us.[10] In order to make the comparison, it was necessary to add indicated extractions and extracted third molars to the Metropolitan sample of present employes, and then to adjust that sample to include a proper proportion of edentulous cases in each age group, assigning to each edentulous case thirty-two missing teeth. The last-mentioned procedure involved recourse to a distribution chart of company personnel for the nearest available date (December 31, 1940), since the dental records of the edentulous cases were filed in a separate drawer and could not therefore be included in the original random sampling procedure. As a result of the application of the several methods, data were made available so that the comparison shown in Table 3 and Figure 3 could be made.

It is evident that the present status of the home office employes as regards teeth retained in the mouth compares even more favorably with that of the country as a whole, including the highest income stratum considered separately, than it does with the previous record within the company fifteen years ago. Up to about 20-25 years of age, the saving of teeth is about equal to that experienced by persons with family incomes of $3,000 or more per year. Beyond 25 years of age, the saving of teeth becomes more and more pronounced among the Metropolitan workers. After 30 years of age, the saving of teeth never drops below three per case as compared with the general white population, and a maximum difference of more than six saved teeth is attained among the home office personnel in their late 40's. In comparison with people whose family income is $3,000 or more a year, the Metropolitan workers are more than two teeth better off from age 35 years onward.

Criticism of this comparison would be justified if a difference were to exist between the two groups in their basic tendency to be attacked by dental disease. The comparison would be invalidated particularly if the Metroplitan group were to be shown to have a much lower DMF rate than the general white population. From the material described in the earlier sections of the present report (Fig. 1), it is clear that the employe group of the Metropolitan tend to show rather a higher dental disease tendency than that found among persons of the same ages in other groups of people. Yet, in spite of that finding, the

employes now at work at the home office lose their teeth at even a lower rate than persons whose family income is $3,000 or more per year.

TOOTH FATALITY RATE

The several comparisons just made between the DMF and tooth loss rates of the present group of Metropolitan employes and other white persons of comparable ages within the company and outside indicate quite definitely that a considerable saving of teeth is accomplished among the home office workers.

Quite aside from that encouraging finding, the data lead to a new concept, which will perhaps serve a useful function in the study of the epidemiology of dental disease. That concept concerns the ratio of the number of teeth lost to the number of teeth attacked by dental disease. Such a ratio is a definite entity and, in terms of the epidemiologic precedent in the medical field, we have chosen to designate it the "tooth fatality rate," to correspond with the more familiar medical analog, the "case fatality rate." Accordingly, the tooth fatality rate is here defined as the number of permanent teeth that have been extracted or are indicated for extraction per hundred permanent teeth showing attack by dental disease (M/DMF). Better than the tooth mortality rate, which is defined as the number of permanent teeth extracted or indicated for extraction per person,[11] the tooth fatality rate will show the true extent to which a program of dental treatment saves teeth, since this rate recognizes regional and other variations in the DMF tendency within its denominator.

The results of deriving such a rate specific for age for the Metropolitan employes of the present time and for the group employed fifteen years ago are shown in Table 4 and in Figure 4. As the material for either year shows quite clearly, aside from the fact that with each advancing year of age teeth are newly attacked and become a factor in the DMF prevalence count, and teeth are newly lost and become a factor in the tooth mortality count, the tendency toward loss of teeth (fatality) becomes stronger and stronger with each year of advancing age. This effect seems entirely natural when one considers that filling procedures, even when undertaken, do not always halt permanently the advances of caries.

The tooth fatality rates plotted in Figure 4 show that the force of fatality is much lower now among home office employes than it was fifteen years ago. For example, a decade and a half ago, employes 17-19 years of age had lost nineteen teeth out of each hundred teeth that had been attacked by dental disease. On the other hand, at the present time, persons of comparable ages have lost fewer than fifteen teeth out of each hundred DMF teeth. Indeed, the tooth fatality has been significantly reduced all along the entire age scale for the whole group of employes now at work, except in the final age group (60-64).

The tooth fatality rates depicted in Figure 4 measure quantitatively the true extent to which teeth are being saved in the present cohort of employes. Although it is interesting and significant to find that the total tooth mortality per person has been lowered within the fifteen-year interval, it is even more significant to discover that among the teeth which have been attacked by disease, the chances of being removed from the mouth have been markedly reduced. Conversely, the chances of teeth surviving after attack have been greatly enhanced over the past fifteen years, even though the attacks by dental disease occur at about the same or perhaps at a higher rate than was the case fifteen years ago. There is little to account for that change in the viability of the teeth, except the influence of the dental service of the home office clinic.

SUMMARY

In order to study the effect, upon saving of teeth, of an industrial dental service based upon "preventive procedures" (dental prophylaxis, dental health education and the recognition and early treatment of early lesions of dental disease), figures for dental morbidity (DMF rate) and dental mortality among home office employes of the Metropolitan Life Insurance Company in 1942 were compared with similar figures for several large outside groups including the composite sample of one of us (H.K.) of approximately 45,000 white adults. The Metropolitan figures were also compared with similar figures from the same company collected in 1927.

As against the outside groups, the home office employes showed a similar or slightly higher DMF rate, but a markedly lower tooth mortality rate. The difference in tooth loss reached a maximum of six teeth per person in one age group as compared with the similar age group in the sample of 45,000 white adults.

Within the company, similar conditions obtained, but on a smaller scale. The DMF rate was slightly higher in 1942 than in 1927, but the tooth loss was lower throughout almost the entire age range, with savings averaging one and one-half teeth per person between the ages of 30 and 45.

Comparison of tooth mortality with tooth morbidity leads to the establishment of a new term: "tooth fatality rate." This rate is the ratio of teeth lost to total DMF teeth, and it seems a fair indication of the success of a dental treatment program. Values are expressed as number of missing teeth per hundred attacked by dental disease. The 1942 home office figures show lower tooth fatality rates than those of the year 1927; with differences of more than ten in the age groups between 30 and 45.

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PRESIDENT'S ANNUAL ADDRESS

C. Raymond Wells, D.D.S., Brooklyn, N. Y.

As President of the American Dental Association, I submit my report to you for the Association year, now fast coming to a close. I am grateful for the opportunity which you gave me to pilot American Dentistry through the troubled waters of 1943 and 1944. Being President of the American Dental Association is a tremendous job and a responsible one. It calls for every fiber of strength in a man and causes him to make untold sacrifices in the interest of the profession. I consider that you honored me by advancing me to this high office and I have endeavored to discharge my duty in a conscientious and fearless manner. I thank you for the privilege of serving you, especially in these trying and critical times. To render a full report would take several volumes of proceedings; therefore, I will transmit what I believe are the most important phases of my year and submit pertinent recommendations for future action.

The American Dental Association continues to cooperate with the Government in curtailing travel to ease the strain on commercial carriers. Thus we meet in so-called abbreviated sessions to transact the business affairs of the Association. Travel conditions have become worse; so the Board of Trustees in all wisdom decided to again hold a streamlined meeting. We hope that next year conditions will be so improved that a full scientific meeting can be held. Our members are hungry for annual refresher courses, which formerly made our Annual Meetings so attractive. As men of science, we are forever seeking the truth, and it is by attending lectures, demonstrations and clinics that much is absorbed, the better to serve our patients.

I visited a great many state society meetings during this year as President of the American Dental Association. The work that state society officers and committees have done in running their annual scientific meetings is indeed commendable. Attendance has been exceptionally large, and the members were serious and eager for the continuation of education and training via the state meeting. Addresses given by state presidents showed vision and interest in planning for tomorrow. To all state officers, past and present, I desire to give my sincere thanks for the excellent job which they have done in these trying times to advance the science of dentistry. To the faithful workers in all state and local societies, my grateful appreciation for their outstanding work in behalf of the members and their profession. Ofttimes, I am sure, our workers in societies wonder if their efforts are noticed and appreciated. I hereby record the recognition due them.

To the faithful staff of our Central Office in Chicago, my thanks for the work that has been done that the administrative affairs of our profession might go forward.

To the Officers, Trustees and committees of the American Dental Association, I express deep appreciation of the arduous duties imposed upon them during the past year. I feel that I have enjoyed their wholehearted support and loyalty, both of which made my load easier to bear.

I have had a busy year—a year that required an untold amount of time in the interest of Dentistry and the Association. The director of Selective Service, Maj. Gen. Lewis B. Hershey, Col. Leonard G. Rowntree, chief of the Medical Division, National Headquarters of Selective Service, and Capt. B. S. Killmaster, United States Navy, the director of Naval Liaison, Selective Service, have been generous during the past two years in permitting me to discharge my duties as President Elect and as President of the American Dental Association. They did not deny one request to participate in the affairs of the Association. I tried to separate my Government duties from those of the Association, but I had to absent myself from

official duties on several occasions to attend important meetings in the interest of Dentistry. However, no government funds were expended for my travel or other business of the American Dental Association. Expenses were met by either the state society or the American Dental Association. In meeting my travel and hotel expenses, several state societies saved the American Dental Association many dollars.

I hope that the House will authorize resolutions to General Hershey, Colonel Rowntree and Captain Killmaster expressing the appreciation of the American Dental Association for their generous cooperation during the past two years.

I am grateful to note the great increase in membership of the Association. It is now at an all time high with a total of 57,076. Credit is due the local, state and national membership committees for their fine work. The importance of our national Association is evidenced by the interest shown in the membership affiliation. Our members are enthusiastic and Dentistry has increased in stature and prestige. The dental profession can hold its head high.

Owing to the conditions imposed by the war, it became necessary to change the meeting from Omaha, Nebr., to Chicago. The Trustees were asked to express their views and while each was reluctant to cancel the Omaha meeting, the decision had to be made. The Secretary and the Business Manager of the Association journeyed to Omaha to study the problem. The chairman of the General Arrangements Committee, H. E. King was consulted. Your President consulted with the Secretary and the Business Manager and with many members of the Association. After mature deliberation, the meeting was transferred to Chicago in the best interests of the Association. The attitude of Dr. King and his faithful group was commendable. I appreciate the excellent work which he and the Nebraska State Dental Society accomplished up to the time of cancellation. Dr. King cheerful accepted the cochairmanship of the General Arrangements Committee with Dr. W. I. McNeil, of Chicago.

The Illinois State Dental Society promptly and cheerfully accepted the responsibility for the meeting, and the members of the component Chicago Dental Society in turn rolled up their sleeves. The appreciation of this House of Delegates is extended to these societies through their respective presidents, N. A. Arganbright, Harold W. Oppice and Howard C. Miller, Trustee.

May 31, 1944, it became necessary to call a meeting of the Ad Interim Committee of the Board of Trustees for the purpose of recommending a plan to the Government through the director of Selective Service, General Hershey, to provide preprofessional and dental students. This became necessary because the Inter-Agency Committee on Deferments, Washington, D. C., would not permit Selective Service to defer civilian students who were not matriculated in schools of dentistry on or before July 1, 1944. With the dire shortage of dentists and the certain continuing shortage for several years, your President felt that some plan should be proposed, if the dental manpower needs were to be met for the duration of the war as well as in the immediate postwar period. The plan in brief was to request the armed forces to discharge 2,000 qualified men for the purpose of studying dentistry. The plan was presented to the authorities, but to date no decision has been transmitted to our Association. Representatives of the Council on Dental Education, American Association of Dental Schools, War Service Committee and Army and Navy committees met with the President and Trustees to weigh and decide on the problem. It is hoped that the Government will yet see the wisdom of the request in the interest of the dental health of our nation.

August 1, 1944, the Secretary of War announced the abandonment of the Army Specialized Training Program for predental and dental students on the grounds that enough dentists had been procured for Army needs.

Your President, together with C. Willard Camalier, chairman of the War Service Committee, and J. Ben Robinson, vice chairman of the Council on Dental Education, met to discuss the drastic measure. The American Dental Association did not approve of the recruitment program of dental students in 1943 and abhorred the regimentation of our dental schools. Yet the armed forces recruited nearly all qualified dental students for the regimented program. One year later, we find the War Department re-

neging on its control and plan. Once having placed the dental students in uniform and subjected our dental schools to untold confusion and administrative difficulties, it would appear that the War Department had assumed a responsibility beyond the immediate needs of the army to maintain the dental manpower needs of the public now and in the immediate postwar era. Obligations assumed are not so easily cast aside. When it is recalled that we have a pool of only 70,000 dentists in practice, civilian and military, and when the armed forces take 31 per cent of them into the service, it would appear that it should assist in providing dentists for the workers who are building the arsenal of democracy. True the students who accept the option of discharge will be deferred through the wise policy of Selective Service in meeting its corollary responsibility to the civilian population, but our apprehension is that many boys who donned the uniform will probably not continue their dental studies, but will remain in the army because of chagrin over being returned to a civilian status in time of war. The public needs dentists and it is a wartime responsibility to provide them if the people are to be relieved of pain, suffering and oral deformity.

Letters and telegrams were dispatched to the Secretary of War requesting a reconsideration on this drastic action. It is believed that the American Dental Association had influence so far as the present classes of seniors are concerned since those graduating in the next few months are to be commissioned in the armed forces instead of being returned to civilian life.

Numerous letters and petitions were received from Army dental officers protesting the discharge of the June 1944 graduates and their utilization in essential civilian activities. We all understand and appreciate the attitude of these dental officers. When young men have part of their dental education paid for by the Government, it is only logical that they should enter the Dental Corps for which they were trained. As it turned out, practically every June 1944 graduate will either enter the Navy or become employed in a critical war area.

There have been many letters received from dental officers expressing dissatisfaction and a few from dental officers of both the Army and Navy over 38 years of age who are desirous of returning to civil life at once. Curiously enough, 99 per cent of the letters come from officers stationed within the continental limits of the United States. The reasons given are: slowness of promotions, resentment of officers because of dentists entering the service with ranks above others who had been on duty for a year or more, inaptitude for the regimented life of the armed forces, fear of never regaining their old practices, the discharge of recent graduates, financial difficulties in maintaining their families, and inability to continue prewar insurance programs, etc. Conferences have been held with Gen. R. H. Mills, Chief of the Army Dental Corps, who assures us that consideration is being given to a policy for the release of older dental officers. It will be done according to a formula based upon limited service status, age, physical disability, hardship, size of family, etc. Considering the thousands of dental officers on duty, the protests are relatively few.

It is interesting to compare the status of dentists in the armed forces in World War II as compared to their status in World War I. In 1917-1918, 4,175 dentists were commissioned. More than 5,000 dentists and dental students served throughout the war as enlisted men in the Army and Navy. In 1944, more than 20,000 dentists have been commissioned in the armed forces, and those dentists who for one reason or another have been inducted and are qualified to receive commissions have received them within a few months after entry into the Army.

In 1917-1918, the highest ranking dental officers in the Army were nine full colonels and twelve lieutenant colonels, with temporary ranks, in the regular Army; while, in the Navy, the highest rank was that of lieutenant commander. In 1944, the Army now has one major general, and a large number of colonels and lieutenant colonels, regular and reserve. The Navy has two admirals and many captains and commanders, regular and reserve.

A majority of the dental reserve officers of 1917-1918 did not get beyond the rank of major in the Army or senior lieutenant in the Navy. In 1944, in the Army of the United States, many dentists who have come into the service during the emergency as reserve officers hold the rank of major, lieu-

tenant colonel or colonel; while, in the Navy, many are serving in the rank of lieutenant commander, commander or captain.

The American Dental Association cannot dictate to the War or Navy departments in matters of policy, but it has consistently championed the rights of dental officers and called the attention of the authorities to promotion injustices, especially promotions from first lieutenant to captain, and other matters. The War Service, Army and Navy and Special Military Affairs committees have all assisted the President and Dr. Robinson in presenting these matters to the authorities.

Professionally, the greatest complaint among dental officers of the Army and Navy is the monotony of the "amalgam and silicate line" as they call it, and the inactivity of remaining as "forgotten men" in replacement pools. Dental officers are definitely more interested in oral surgery and prosthetic service than in straight operative duties. This is usually due to their having to meet a daily quota of a given number of fillings. The establishment of such quotas should be discouraged. From reports received, it does not promote morale or produce the greatest operative ability. Despite the few protests, the Army and Navy Dental Corps have done and are doing a magnificent job—the greatest dental rehabilitation service in the history of the nation. I salute our dental officers!

WASHINGTON OFFICE

I have been impressed with the busy Washington Office of the American Dental Association. Dr. Camalier and his staff are all hard working people. The strategic location of this office is of tremendous value to the Association. In the nation's capital, it is in a position to act speedily and effectively for Dentistry. All national organizations have a Washington office to care for the immediate needs of the organization and to acquaint interested parties in matters of great import. Generally, decisions must be made quickly and in these trying times, especially, the need for competent representation is apparent. The American Medical Association followed the wise policy of the American Dental Association in establishing a Washington office. Our office is especially efficient because of Dr. Camalier's wide acquaintance with official Washington. One cannot begin to measure in dollars and cents the value of this man to organized dentistry. He gets releases and publications promptly that it would take others days to obtain. I do not know who could do this should he not continue. His loss would be a terrific blow to us all. Those who do not know Washington cannot appreciate the value of our office there or the value of Dr. Camalier. His report will bear careful scrutiny. His modesty in its preparation is such that it does not begin to tell the whole story. In these days of indispensable men, Dentistry has this man in that category in Washington. We should prevail upon him to become our full-time representative there. I recommend that the American Dental Association consider him for full-time employment and submit a proposition to him. However, I fear he will insist upon being employed part time as he is now engaged.

I have had much difficulty in securing secretarial assistance in Washington, as all of us would expect; consequently much of my work fell upon the Washington office. Dr. Camalier and his efficient secretaries, Miss Kay and Mrs. Gray, would come to my office to take dictation, type the material in the American Dental Association office and deliver the product to my home. I cannot adequately express my appreciation for this assistance, without which I could not have efficiently executed the duties of the office of President. My grateful thanks are herein recorded.

LIAISON IN WASHINGTON

People are needed in Washington to advise Congress and national organizations, and to represent other affairs of the American Dental Association, if we are to be on our toes and protect both the public and the profession. Ask the American Dental Trade Association, ask the American Dental Hygienists' Association, ask the technicians, yes, ask the Council on Dental Education, the American Council on Education or the American Association of Dental Schools. If we are to be foresighted and alert in these days and in the perplexing postwar era, we must act wisely and retain and strengthen our liaison via our Washington office. If we dispense with the office, we can only turn to the Washington Office of the American Dental Trade Association, which even now

is receiving many queries from dentists and dental schools.

COMMITTEE ON LEGISLATION

The stories of the Committee on Legislation and its activities are legion. You have read of its efficient and prompt service for dentistry as published frequently in the pages of our journals. Sterling V. Mead, the chairman, is a genius. With his efficient office staff, and with Mr. Fox in the Central Office, Chicago, Dr. Mead and his committee have rendered a service that is definitely outstanding. I shall not enumerate the accomplishments of this committee and of its dynamic chairman but I am amazed when I even try to follow its activities. Words cannot express my appreciation and regard for Dr. Mead. I recommend that special commendation be accorded him by the House of Delegates, in the form of a scroll, for his outstanding services on behalf of the profession that he serves and loves.

PROSTHETIC DENTAL SERVICE COMMITTEE

The Prosthetic Dental Service Committee deserves commendation for tackling a matter that has been too long neglected by our century-old profession. I have met with C. A. Nelson, worthy and efficient chairman, on several occasions during the past year in an attempt to determine how we could best improve relations among the dental laboratory, the dental technicians and the American Dental Association. In these days, when 95 per cent of our members are dependent on the dental laboratory for technical service on prosthetic appliances, we must approach the matter realistically and wisely. That better liaison and understanding are needed between the dentist and the dental laboratory is beyond question. The answer is not in licensure or registration. It lies deeper than that, involving human relations and understanding with the richness of paternal guidance and counsel. We believe that the profession, the laboratory and the technicians should get a little closer to the family of dentistry. They should play on our team and we should give them a strategic position. The committee and I believe that this can best be accomplished by a program of accreditation wherein the laboratories will have better standing in the business world and better relations with us. With our approval of ethical laboratories and assistance with their mounting problems, we can improve their laboratory service to us and, in turn, our professional service to the public. I strongly urge you to give serious attention to the report of the Dental Prosthetic Service Committee and its recommendations. Our action would be timely and would stamp our Association as possessing a vision and foresight capable of advancing dentistry in the postwar area. We have met with various dental laboratory representatives to get their views and opinions and, generally, they appear favorably disposed to our plan. They were all interested and cooperative. I recommend that the Dental Prosthetic Service Committee become a standing committee and that, for the coming year, the committee be retained as now constituted by action of the House of Delegates via standing resolution.

Your President has enjoyed exceedingly fine relations with the Trade. I have met with their representatives in Washington on mutual problems and am impressed with the desire of the manufacturers to assist us. Incidentally, several executives of the dental manufacturers are dentists. The American Dental Trade Association office in Washington, through Mr. George Lilly, has been exceptionally helpful to us and I desire to express my gratitude. I had the honor to address the annual meeting of the American Dental Trade Association in Chicago June 28. It was an interesting occasion and it was a fine group to talk to. There are many problems ahead of mutual interest and we should plan now to assist in their solution.

Incidentally we have a committee known as the "Committee to Cooperate with the American Dental Trade Association." Since all manufacturers are not members of this; and to avoid discrimination, I recommend that the name of the committee be changed by the simple deletion of the words "American" and "Association." My thanks and appreciation to this committee headed by Frank J. Hurlstone, of Chicago.

SALVAGE

The Salvage Committee, headed by Carl Sachse, of New York State, deserves our grateful thanks. Dr. Sachse and his committee have rendered a noble wartime service in a difficult field. His activities in New York State during the past years have been

unique and fruitful. His report will bear careful consideration.

COMMITTEE ON NATIONAL DENTAL MUSEUM AND THE DENTAL REGISTRY

If the future of Dentistry is to stress more of the scientific, we should consider the recommendations of this committee very seriously. Henry A. Swanson, of Washington, and his committee and his associate, 1st Lt. Henry M. Goldman (DC), have quietly and efficiently raised our sights in the field of pathology, with the generous assistance of the Army Medical Museum. It was my privilege to spend some time in the museum to learn first hand of what this committee was doing. "The Atlas," for instance, is a classic example of one phase. What a contribution to dental science! We need to know more of dental and oral pathology. The book has not yet been published dealing adequately with maxillofacial bone pathology. Follow the dictates of this committee. Our knowledge will be enhanced on this important subject. The establishment of one or more research fellowships should be approved forthwith, as recommended by the committee. To Dr. Swanson and his committee and to Lieutenant Goldman, Col. J. E. Ash (MC), and others of the Army Medical Museum, my grateful appreciation.

COUNCIL ON DENTAL EDUCATION

While the Council on Dental Education will render its report, I do wish to state that I have been exceptionally impressed with the excellent, timely and efficient work of this important body. I have followed its work with unusual interest. Nothing is more dental than this committee and nothing so important in the field of denal education. If Dentistry is to maintain its coveted place alongside other fields of education, it must place special emphasis on the work and activities of the Council. The job of accrediting dental schools is tremendous; in fact, stupendous. It was and is still misunderstood. If we but review the field of dental education and accreditation in the past, we will understand what a vital life line this Council is today. We must give full support and encouragement to it and to its members. I recommend that any doubting Thomas in the Association who is apprehensive, fearful or unacquainted with the accomplishments of the Council on Dental Education meet with me and I will gladly orient him. To the chairman and members of the Council and to Harlan H. Horner, my thanks for a difficult job exceptionally well done.

HISTORY COMMITTEE

To W. Harry Archer and his committee for an excellent job during the past year: The Committee is particularly fortunate in having such a capable and interested chairman.

The following letter was received from the National Research Council of the United States Government:

April 25, 1944

Dear Captain Wells:

The National Research Council in July of 1940 was asked by the Surgeons General of the Army and Navy to cooperate in planning an overall Medical History of the Emergency, and this has subsequently developed into planning the Medical History of the War. The subject of Dentistry had originally been planned in two sections, one assigned to Medicine and the other to Surgery.

At the last meeting of our Subcommittee it was recommended, in view of the increasing importance of the dental services in the war effort, to have a separate volume devoted to Dentistry and I was instructed to lay the matter before you in the hope that you would be willing as President of the American Dental Association to undertake the responsibility of planning such a volume. Most of our editors of individual volumes are out of uniform, and the request comes to you from the N.R.C. to the American Dental Association rather than as an official request from Admiral McIntire.

If you should choose as authors men who are in uniform, official designation would be required from the Offices of the Surgeons General if they are to be appointed. Civilian authors would be nominated by you and ultimately passed on by the Subcommittee and Dr. Lewis H. Weed as Chairman of the Division of Medical Sciences.

I do not like to press you unduly; but if you feel able to assume the editorship of the volume, we should like to have word to this effect prior to our next meeting on May 6. If it were at all possible for you to submit a tentative outline with chapter breakdown and tentative author assignments by that time, we should be most grateful. If you write me prior to May 5, would you address the letter to New Haven?

I enclose a prospectus drawn up two years

ago to give you a general idea of the plan. A revised prospectus is being compiled, and I shall see that you have a copy as soon as it is available.

With kind regards, believe me.

J. F. FULTON, M.D.

Thus you will see that Dentistry has been asked to write its own volume for World War II. This is a tremendous responsibility, but one which will be met. It so happens that I was asked by the National Research Council to become the editor-in-chief. I accepted because of the urgency of the request as well as to commence as early as possible the job for Dentistry. I was requested to appoint two assistant editors, which I did, selecting both from the History Committee of the American Dental Association, W. Harry Archer and William A. Hodgkin. Both men are historians in their own right and have been of great assistance to me. Dr. Archer and I have both met with John F. Fulton, chairman of the History Committee of the National Research Council. We received a cordial reception as well as a working formula.

The National Research Council, even though a government agency, does not have funds to pay for travel expenses and certain other incidentals in connection with this history. I recommend that the House of Delegates authorize an appropriation of $2,000 for 1944-1945 as anticipated expenses in connection with the writing of Volume VII, "Dentistry in World War II."

The duties of my government position in Washington are increasing. I do not see how I can continue as editor-in-chief of this volume on dentistry even with my able lieutenants, Archer and Hodgkin, and the chapter authors; therefore, I must step aside and request you to permit the Board of Trustees to appoint an editor-in-chief. I have been willing to step into the breach and develop the outline, but I must ask that you excuse me from continuing as editor-in-chief. We have many capable men and the Trustees can give this their careful study. It is a great honor to be known as the editor-in-chief of the History of Dentistry in World War II and I am grateful for having been selected, but I must forgo this honor in deference to my official and other duties. I shall submit recommendations to the Board of Trustees and in turn to the National Research Council for chapter authors for the volume and I trust that you will authorize the Board of Trustees to ratify the appointments.

MEMBERSHIP COMMITTEE

I like to call the Membership Committee the life line of the American Dental Association. The chairman, Paul W. Zillmann, his able committee and membership committees of state and local societies have worked zealously the past year to increase the membership of this Association. The membership is now at an all time high. It is interesting to note that the Dental Society of the State of New York, through its component societies, the first and second district, absorbed the Allied Dental Council and its component societies in Greater New York. Incidentally, this meant an increase of members, although not in the numbers that we were led to believe. The significance of this absorption is sound in that all ethical practitioners of dentistry should be members of the American Dental Association. I thank Dr. Zillmann, his committee and all membership committees of our component societies for their efforts during the past year.

INSURANCE COMMITTEE

The Insurance Committee of the American Dental Association deserves recognition for the fine work which it has accomplished during the past year. It is gratifying to note that double indemnity was added to the insurance policy in case of certain types of accidental death and that the coverage has been increased 5 per cent and without additional premium cost. We are pleased to express our appreciation to A. D. Weakley and Fred A. Richmond.

SPECIAL EVENTS AND CONFERENCES

Your President visited Cleveland, Ohio, to participate in Cleveland Dental Health Day. An interesting meeting was arranged, with appropriate ceremonies, with special emphasis on preventive dentistry for children. The great interest which the Cleveland Dental Society aroused in educational and civic groups is interesting to observe. Children's dentistry needs special emphasis by our profession in general because it is at this stage of life that preventive dentistry must be fully exercised. It is hoped that, in the future, each constituent and component society will

devote a special emphasis meeting each year on children's dentistry. It is also hoped that dental colleges which do not have a full-time department of children's dentistry will consider seriously the establishment of such a department with a full-time professor, thereby dignifying this important dental service. It is believed that we should give more encouragement to the establishment of a distinct specialty of pedodontia.

To the Cleveland Dental Society and all other societies which emphasize children's dentistry, our sincere thanks and appreciation.

Representatives of the American Dental Association were authorized to attend conferences of special organizations to determine the import of their proceedings as well as to advise whether the American Dental Association should, in the future, participate. To the National Wartime Conference of Professional and White Collar Workers went Walter A. Wilson, of Jersey City. Dr. Wilson's report is interesting, but no recommendations are submitted other than that our Association should be represented at future meetings of that conference.

To the Committee on Food Distribution for the Suffering Children of Europe went Leuman M. Waugh, of New York City, to represent the American Dental Association and to discuss with leaders of professional and business life the needs for developing a plan to feed the undernourished and underprivileged children of Europe. Dr. Waugh reports, and I concur, that the American Dental Association should support this movement and actively interest itself in this great rehabilitation project. No financial request is made.

To the one-hundredth anniversary of the founding of the Medical School of Western Reserve University, Cleveland Ohio, went Wendell D. Postle, of Columbus, Ohio, as official delegate from the American Dental Association. American Dentistry was pleased to bring greetings to the university on that significant occasion.

To the National Council on Rehabilitation, New York, N. Y., went C. Willard Camalier, representing the American Dental Association. Dr. Camalier rendered an interesting report which was referred to the Council on Dental Health. The report will probably contain recommendation for this Association to become a participating member of this Council. In this, I concur.

To the American Association for the Advancement of Science went Lt. Cmdr. J. S. Restarski (DC) USN, to represent the American Dental Association at the meeting of the dental subsection. Dr. Restarski's presence at that meeting assured the American Association for the Advancement of Science of the intense interest of Dentistry in science.

To meetings of the War Activity Committee of the American Medical Association, in New York and Chicago, respectively, went Joseph M. Glaser and C. Willard Camalier, as invited guests. Both members report interesting conferences with this committee of the American Medical Association.

Various other meetings were held in Washington: the Pepper Committee of the United States Senate; the House Naval Affairs Committee meetings on dental research; hearings on the Public Health Bill and Conferences with the following: offices of the Surgeon General; War Production Board; Veterans Administration; Office of Price Administration; Committee on Historical Records of the National Research Council; Procurement and Assignment, and Federal Security Agency. A joint meeting between the legislative committees of the American Medical and American Dental Associations was held in Washington and attended by a substantial number of representatives from both organizations. Such meetings are conducive to good relationship and solidarity for the establishment of future policies. Representatives of the American Dental Association, which included the President and President Elect, also attended the open hearing of the American Medical Association legislative committee. It was noted at this open hearing that members of Congress and representatives of Labor and Management were present. The conference was interesting and showed that the American Medical Association intends to take a more active interest in national programs.

A committee was appointed by the International Relations Committee of the American Dental Association to determine ways and means by which dental aid can be given to the Chinese Government.

A meeting of employes of the Central Office of the American Dental Association was arranged which your President had the honor of attending. A $100 War Bond and a $50 War Bond will be presented to the two employes of the Central Office who offer the best suggestions for improvements in their department. Suggestions have already been submitted and the winners have been announced. The Award Committee consisted of the Secretary, chairman of the Budget Committee and the Business Manager. It is believed that this procedure will stimulate interest of employes in Central Office affairs.

Your President is enthusiastic about the state officers' conference and believes that it should continue each year. This meeting of state officers is not only stimulating to all concerned, but is of value to each state society. Much credit is due to the officers and committees concerned with the conduct and program of the conference.

The Vice Presidents of the American Dental Association were invited to attend meetings of the Board of Trustees. Your President is of the opinion that their presence at the Board meetings is of much value to the Board and to the American Dental Association as a whole. It is recommended that the Vice Presidents be included in invitations to attend all future regular meetings of the Board of Trustees and that their expenses to such meetings be allowed. The Vice Presidents assisted the President during the past year by representing the American Dental Association at certain state meetings. It is not possible for the President or President Elect to cover all state meetings, but it is believed that officers of this Association should attend as many state meetings as possible during each year, thereby bringing the official family of the American Dental Association to the annual meetings of constituent societies.

We are concerned about the activities of certain medical schools in attempting to designate dental schools as the dental department of schools of medicine. This means the loss of autonomy of the dental school, placing it in the same category as a specialty of medicine. It is to be remembered that specialists in medicine are doctors of medicine. Dentistry is a separate profession and one of the health services, which includes medicine. While dentistry is a health service, it is not a specialty of medicine or of medical practice. A separate practice act exists for each profession for the benefit of the public. It is recommended that this House of Delegates draft resolutions protesting such action on the part of universities and medical schools. The resolutions should be forwarded to the following: the American Council on Education, Washington, D. C., the Council on Medical Education and Hospitals, the American Medical Association, the American Association of Medical Schools, the American Association of Dental Schools, the Council on Dental Education of the American Dental Association and the presidents of all universities that have medical schools. Dentistry is an autonomous profession and so recognized by the public and its position as a separate profession cannot be lightly eliminated by relegating it to the position of a subordinate activity of medical schools. Until such time as joint and official action of the American Medical and the American Dental Association approves of amalgamation, the American Dental Association registers its opposition to the relegation of schools of dentistry to the position of departments of schools of medicine.

The American Dental Association notes with concern the efforts of some outstanding members to lower the standards of dental practice by suggesting the delegation of certain forms of dental service to auxiliary personnel. It is recommended that the House of Delegates record official objection to the lowering of dental standards, dental practice and dental education, and furthermore that all state dental societies be alert to vigorously oppose any plans which debase the practice of dentistry.

It is noted that the United States Government through its Department of Labor is establishing vocational schools for dental technicians. Your President and various committees of the American Dental Association are inquiring about such plans. It is recommended that this House of Delegates, by resolution, request the Department of Labor that, in the establishment of vocational schools for auxiliary dental personnel such as dental technicians or dental assistants, it accord the privilege to the American Dental Association of advising the Department of

Labor on any contemplated vocational training courses of a dental or quasidental nature.

MILITARY AFFAIRS COMMITTEE AND PROCUREMENT AND ASSIGNMENT SERVICE

The chairman and committee members concerned with military affairs and the Procurement and Assignment Service have rendered exceedingly valuable service to the dental profession. The duties imposed upon these committees have been of an arduous and quasi-official nature. The activities are too well known to all members of the profession for me to give a detailed report or explanation. I desire to express deep appreciation for the excellent service to the Nation during these critical times.

COUNCIL ON DENTAL HEALTH

The Council on Dental Health has a tremendous field. It is a large body of serious-minded members and laymen interested in carrying out your wishes in the field of dentistry for the people. The appointment of Allen O. Gruebbel as executive secretary of the Council is a forward and important step. Dr. Gruebbel has met with many state dental society groups to acquaint them with the plans and policies of the Association. We were fortunate to secure Dr. Gruebbel for this arduous and important duty. I shall let the report of the Council tell the story.

To Emory W. Morris and his able committee, my grateful thanks for work in a field as complicated as any I know.

COMMITTEE ON PHYSICAL FITNESS

The Federal Security Agency and the American Medical Association formed a team for the purpose of promoting physical fitness.

The National Committee on Physical Fitness met in Washington, D. C., July 14 and again July 27 and 28, to promote interest on the part of the public in greater emphasis on physical fitness which, of course, includes dental fitness. Originally, the movement started with the Federal Security Agency. Later it joined the American Medical Association in the development of a program designed to place special emphasis on the subject. Col. L. G. Rowntree, chief of the Medical Division of Selective Service, is the chairman of the joint committee of the American Medical Association. Members of the Committee are as follows: Dr. Roscoe L. Sensenich, Dr. Morris Fishbein, Maj. Gen. George F. Lull, Dr. William Stroud, Dr. L. A. Buie, Dr. Hiram A. Jones, Dr. John W. Studebaker, Mr. Arch Ward, Mr. A. H. Pritzlass and Capt. C. Raymond Wells.

Your President is a member of the joint committee, which is the policy making committee. Lon W. Morrey, Director of the Bureau of Public Relations, American Dental Association, and Emory W. Morris, chairman of the Council on Dental Health, American Dental Association, are cochairmen with Olin West, American Medical Association, of the medical affiliate group of the Program Council of this Physical Fitness Committee.

The purpose of the organization is to enlist the interest of the public in a special emphasis program on physical fitness. The emphasis will be promoted by civic organizations, church groups, medicine, dentistry, education, labor, management, sport groups and promotion groups.

It is believed that it will result in a successful movement for better health and physical fitness. The interest of the American Medical Association in a quasigovernmental activity is significant, showing that American Medicine is interesting itself in a sound program of public relations. Included with the American Medical Association are the American Dental Association, the American Hospital Association and the American Pharmaceutical Association. In any movement designed to encourage the prevention of disease, the American Dental Association must play an active part. Therefore, our Association will work side by side with the American Medical Association in this physical fitness program. It is anticipated that the dental profession will be called upon to conduct dental examinations of school children and certain adult groups as well as to aid in the establishment of practical methods for calling the attention of the public to its part in promoting dental fitness, and to encourage the correction of remediable dental conditions.

WAR LOAN DRIVE

The United States Government asked the

dental profession through the American Dental Association to participate in the Fourth and Fifth War Loan Drives. Your President, together with C. Willard Camalier, met with a representative of the Treasury Department and planned the part in which Dentistry was to participate. I am pleased to report to you the enthusiastic and wholehearted cooperation of all state and component societies. Dentistry can be very proud of its participation and the amount subscribed both by the armed forces and those in civilian practice. I take this opportunity to thank all who participated and thus rendered distinct financial assistance to our nation in time of war.

HORACE WELLS CENTENARY COMMITTEE

The Horace Wells Centenary Committee, headed by E. M. Clifford, of Hartford, Conn., is developing an interesting centenary celebration to commemorate the discovery of the anesthetic properties of nitrous oxide by Horace Wells, a dentist of Hartford, Conn., in 1844. It is meet and fitting that American Dentistry should commemorate this significant event and properly record it in the annals of history. The committee and its advisers have worked diligently for the past year and a half to insure a fitting tribute. The History Committee of the American Dental Association has cooperated with the Centenary Committee in establishing certain data and recommending the placing of an appropriate plaque where Horace Wells was said to have lived or practiced. We look forward with keen anticipation to the celebration scheduled for December 1944, and desire to express deep appreciation to the chairman and his able committee for their outstanding work.

ARMY, NAVY, PUBLIC HEALTH SERVICE AND VETERANS ADMINISTRATION

I desire to express my appreciation of the excellent relations that have existed during my administration with the dental officers who head these great organizations. Innumerable problems have arisen which called for cooperation. The chiefs of these departments gave unstintingly of their time for Dentistry. With 31 per cent of the members of the dental profession in those organizations and with dental officers in every theater of war, on land and sea, there have been many problems which called for cooperation. The abandonment of the Army Student Training Program took place despite the objections of Major General Mills, Col. Francis Fitts (MC) and Major McCrae (DC). This ill-fated and unwarranted program was abandoned over the objections of these officials as well as of Dentistry. Once it was inangurated, it should have been maintained. Since much has been published in the journals of our Association about it, I shall not dwell further on the subject, except to say that for the past six months Drs. Camalier and Robinson, Lt. Col. L. H. Renfrow (DC) and I have devoted a terrific amount of time to the matter. Meetings and conferences galore were held in Washington—but to no avail. Would that you could visualize the time we gave to this matter! Selective Service now defers all of our dental students (except those Navy V 12's who are in uniform and in school according to the wise, visionary and consistent policy of the Navy). Dentistry is a health service exceeded in its needs by the population only by medicine. This country cannot be so short sighted as to fail to provide for the needs of this great and vital public service. A service as vital in peace as it is in war, and with increasing and known needs, especially in the postwar era, an uninterruptcd flow of dentists into the profession must continue. To the Interagency Committee on Deferments in Washington and to Maj. Gen. Lewis B. Hershey, director of Selective Service, our grateful thanks for vision and foresight in providing manpower for a health service with a known and dire shortage of personnel.

If we will accord the same service to our countrymen that we do to our machines, we shall have a nation fit to fight at all times and fit to preserve peace in a world hungry for it. This cannot be done without dental fitness, and dental fitness in turn cannot be provided without dentists. All this can be done on a voluntary basis supplemented with sound educational research and preventive programs. No compulsion is necessary or should ever be tolerated by the people of our democracy. I recommend that our Association again reiterate that it is opposed to compulsory health plans. I

further recommend that this Association advise the Congress and the people that it stands ready to assume leadership in the field of dental health for the masses, based on sound principles of application.

RECIPROCITY

There are many occasions when members of the dental profession are required to change their location and move to another state for sound and just reasons. These reasons may arise out of past or present illness of the dentist concerned or members of his immediate family. The denial to worthy cases of the right to practice in another state ofttimes renders an individual a maladjusted member of the profession. The method which obtains to secure a license in most states is for the practitioner of another state to take either the whole state board examination, both theoretical and practical, or the practical alone. If a dentist has conducted a successful and ethical practice in another state and can produce outstanding recommendations from his state board of dental examiners, state dental society and respected members of his community, and sound and bona fide reasons for changing his location, authenticated with proper affidavits, it would seem that rather than require him to undergo the usual qualifying state board examination, a committee of the state board of dental examiners should permit the applicant to present his reasons for moving into their state and, having determined that just reasons exist, permit him to be licensed. It is believed that this method is more just than the methods currently in vogue. I strongly urge that the state boards of dental examiners consider a change in their methods, thereby easing the situation regarding reciprocity procedures. Special consideration should be given to dental officer veterans of the World War.

SOCIAL RESPONSIBILITY

During the past few years, I have appeared on the platform of many state societies and of some component societies. It is my belief that socialization of the dental profession will never be legislated in this nation of individual achievement. It is decidedly undemocratic to take one special group of workers, in this instance, dentists, and compel them to serve in time of peace in any governmental capacity. If we think this matter out clearly, we can assure ourselves that socialized dental service is as impossible as socialized grocery service or socialized trade service of any kind. It is just not American to compel one class to do something that another class of people is not doing. That there will be inroads into our profession through the extension of educational, industrial, community, municipal, state and government agencies is not denied. I state with positive assurance that the private practice of dentistry will remain. However, it is conceivable that the demands for industrial, institutional, governmental and community dental practice will increase, thereby affording opportunity for practitioners of dentistry to enter paid positions. However, it will be left to the individual dentist to decide whether he desires to become employed in industry, schools, city or state or by the government or to conduct his own private practice. I predict that approximately one-third of the members of the dental profession will be engaged in some form of paid dental practice and that two-thirds will continue in private practice. The American Dental Association is mindful of its social responsibility and is ready and willing at all times to cooperate with any agency in improving the dental service for all the people, but is absolutely opposed to any form of compulsory service. Through the instrument of our Association and its competent societies, American dentistry will exercise eternal vigilance, to the end that private practice shall be preserved and that sufficient extension of dental service will be made for the benefit of low income groups and the legally dentally indigent.

THE AMERICAN DENTAL ASSOCIATION AND SERVICE TO ITS MEMBERS

The great majority of members of the dental Association are not familiar with what organized dentistry is doing for them. I appeal to all delegates and officers of constituent and component societies to report to their respective groups at the earliest opportunity and tell them of what the American Dental Association is doing for

each member. It is apparent that a better public relations program should be instituted by this Association for its own members. The American Dental Association must go to its members and explain in local and state meetings what we can expect of this national organization. This can be done through the media of well prepared speeches and moving pictures. If our members could but note the great amount of time that its representatives are spending for them and for the public, they would be satisfied. A Trustee should visit societies in his district once or twice a year to bring the official family of the American Dental Association closer to the members. Representatives of the Central Office should be on the platform at state meetings to inform the members of what 222 East Superior Street is doing for them. The power of the American Dental Association is great and the members should feel secure in that it has such an organization to champion their rights. I recommend that some representative from the Central Office visit each state society at least once every three years.

POST WAR ACTIVITIES

The American Dental Association is giving current study to the adjustment of the profession in the postwar era. We cannot wait until the war is over or peace is signed to prepare for this period. Consequently, I designated the War Service Committee as the over-all committee on postwar affairs. Dr. Camalier, through the Association's Washington office, is in a strategic position to represent the Association in dealing with various government agencies concerned with postwar problems. I recommend that the War Service Committee be designated as the Committee on Postwar Affairs.

On March 6, 1944, your President addressed letters to the directors of all government agencies, calling their attention to our interest in postwar plans and offering to assist those agencies in any plan involving dentistry or dentists. Replies were received from every agency and all expressed appreciation and signified that they would take advantage of our offer.

I believe that the American Dental Association should prepare itself with the following matters for the postwar era:

1. Establishing lists of communities (especially rural areas which do not have an adequate number of dentists) from which young dentists and other dental officers who desire to select a new location, can make their selection.

2. Directory of all dentists.

3. List of government, school staff and other dental positions, internships, residencies, facilities offering refresher courses and graduate courses.

4. Suggestions to dental schools to inaugurate courses designed to help the new dentist and to augment the undergraduate courses in dental schools, such as courses in practice management, business affairs, public health dentistry, short courses in scientific problems, current methods of research, hospital procedure and hospital operating room technic. Dental schools can give greater consideration to informing a student as to how to handle his business affairs intelligently and how to conduct his office efficiently with special regard for his patients. Dental ethics should be presented to him with special application in his every day practice, supplementing the over-all theory and broad concept of ethics. Schools should place more emphasis on social trends and the responsibility of the dentist in regard to them. Many young dentists make serious mistakes without realizing it and resort to commercial methods, which antagonize their patients and colleagues, and unwittingly become entangled in legal difficulties. The opinions on the social and economic phases of dentistry are too frequently based on prejudice rather than knowledge. Dental schools should consider their curricula for the postwar era and include in them special training to better fit graduates for the society they serve.

5. Closer liaison with other health services.

6. Accreditation of specialists in dentistry by means of American dental boards.

7. Accreditation of hospitals which have or will have dental or oral surgical service.

8. Accreditation of dental laboratories to improve liaison between the profession and the dental laboratories and to improve technical service to the dental profession.

9. Broad educational programs for both dentists and the public.

10. Greater interest in and a definite program for dental research.

11. Establishment of a research fellowship at the Army Medical Museum.

12. More field work by representatives of the Central Office.

13. A sound business-like pension program for all full-time paid employes of the American Dental Association.

14. Maintenance of a permanent Washington, D. C., office.

15. Biannual survey of dental laboratories and dental technicians.

16. Annual joint meeting of legislative committees of the American Medical Association and American Dental Association.

17. Encouragement of dentists to greater civic responsibility.

18. Forceful participation of the American Dental Association in all national affairs.

19. Liaison with Congress.

20. Publication of pamphlets to advise dental officer veterans of benefits to which they are entitled.

21. Promotion of reciprocity for licensure.

22. Improved dental journalism.

23. Programs to attract more and better students for dentistry.

24. Prize essay contests among dental students and practitioners.

25. Greater emphasis on children's dentistry.

26. A long range planning program.

27. Disposition of surplus government equipment.

28. Rewriting of Constitution and By-Laws.

29. Maintenance of autonomy for Dentistry.

30. Community plans for dental treatment.

In closing, I desire to again express my deep appreciation to the Officers, Trustees, chairmen and members of various committees and the Delegates here assembled for the fine work that they have done on behalf of dentistry during the past year. The times have been perplexing and perhaps confusing, but each has discharged his duties well and should receive public appreciation. Those in the civilian practice of dentistry have worked harder than at any other time in their professional career in the ministration of dental services to the people in the United States, the arsenal of democracy. To those members in the Dental Corps of the armed forces and the public health service, the gratitude and appreciation of the entire American Dental Association for great sacrifices in order that our fighting men might be fit to win this global war and to preserve all that America holds dear. To them, we state that the American Dental Association will not let them down and that we are prepared to assist them in every possible way consistent with the concepts of the American Dental Association.

A digest of the benefits for veterans of World Wars I and II is being currently prepared and, in a short time, will be available to those who seek advice concerning the benefits to which they as veterans are entitled.

Some members of the Dental Corps of the armed forces have made the extreme sacrifice. To them, no further benefits of their Association are possible; but they have not died in vain, and this Association, with appropriate commemoration, will long remember the contribution which they made that we might live. May they rest in peace in that land from whose bourne no traveler returns.

THE JOURNAL *of the* AMERICAN DENTAL ASSOCIATION

L. PIERCE ANTHONY, D.D.S., Editor
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Communications intended for publication in the scientific or literary pages of THE JOURNAL should be addressed to the Editor. All advertising or business matter should be sent to the Business Manager.

Subscription is included in the annual membership dues. The subscription rate to non-members is $5.00 a year in advance, this rate applying to both domestic and foreign subscriptions. All foreign subscriptions are to be paid in United States money.

DECEMBER 1 — *Editorial Department* — 1944

THE EDITOR'S SWAN SONG

AT the recent meeting of the House of Delegates of the American Dental Association, the Trustees recommended that Dr. L. Pierce Anthony, the present Editor of THE JOURNAL, be made Editor Emeritus. The adoption of this recommendation by the House of Delegates brings to a close our active editorship of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION.

As our swan song, it seems more or less fitting that we should, at least, for the benefit of those interested, give a brief accounting of our stewardship as we view it in retrospect.

In 1937, *The Dental Cosmos* was merged with THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION and deeded to the American Dental Association without fee and with only one condition; namely, that the then Editor of *The Dental Cosmos,* Dr. Anthony, be made Associate Editor of THE JOURNAL, to become Editor when the then Editor of THE JOURNAL, Dr. C. N. Johnson, retired.

The Associate Editor entered upon his new association with high hopes and an abundance of enthusiasm, and conducted THE JOURNAL for

several years upon the policy that had proved so successful in the conduct of *The Dental Cosmos.*

That policy as then set forth was a constant endeavor to promote the scientific aspect of dentistry to the end that dentistry might take its proper place among the biologic scientific professions.

When we first became associated with dental literature in an editorial capacity, there was constant and insistent urge for more of what was designated as practical articles on dental subjects. The scientific in dentistry was just being realized by some of its advanced thinkers and it was also being recognized that dentistry, in order to establish and maintain its status as a branch of the healing art, would be compelled to justify its acceptance among the biologic sciences.

The Editor has during the succeeding years and, in fact, throughout his association with *The Dental Cosmos* and THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION borne this desirable end in view and has exerted every effort to the accomplishment of that objective.

And while we have at times been much discouraged at the progress made in that direction, we believe that we have contributed somewhat to that desired aim.

It is with regret that we relinquish editorially the task toward the scientific, in which our editorial position has been a definite vehicle, at a time when the future of dentistry is in much uncertainty. We relinquish it, however, to other hands.

In relinquishing our editorial duties with THE JOURNAL, we are fully appreciative of the contacts that have been throughout the years a source of postgraduate education and a source of continuing interest to everything pertaining to dentistry, its science, its art, its educational activities, its public service, its Army and Navy, industrial, political and social relationships. Most cherished of all are the personal friendships which through fair weather and stormy have been unfailing. These are the finest fruit of any life-work, and for these the Editor is grateful beyond words.

HORACE WELLS CENTENARY HARTFORD, CONNECTICUT, DECEMBER 11, 1944

On December 11, 1944, at Hartford Connecticut, the dental profession will have the privilege of celebrating the hundredth anniversary of the discovery of the phenomenon of general anesthesia by Horace Wells, a native of Hartford, and a pioneer in dentistry in America.

The question of the priority of the discovery of anesthesia has long been a moot one—both dentistry and medicine claiming the honor for one of its adherents. On occasion, it has appeared that the facts and rights in the premises have been so confused and distorted that Wells, the dentist, might be deprived of the honor of the discovery. In medicine, strenuous efforts have been made to establish prior claims for this signal honor for Crawford W. Long, a physician of Georgia; and, among the laity, several pseudoliterary efforts have been made to discredit the dental aspirant through appeal to the fictional romance of the story of anesthesia. The dental profession, however, has been ever on the alert to its interests, and in the past few years has been able to establish beyond doubt the priority of the claims of the Wells adherents to the discovery of anesthesia in Hartford and by Wells, in 1844; and the coming Hartford celebration, we believe, will signalize the validity of the claims of dentistry.

The program for the Centenary celebration, under the direction of Dr. Arthur H. Merritt, of New York, which is now complete, is published in another department of the present issue. The personnel of the program is a guarantee of the authenticity and validity of the presentations at the Hartford meeting, and we trust that, from that time, there will never again be raised the question as to the rightful discoverer of this boon to humanity.

Dr. Howard R. Raper has been an asssiduous student of the claims of the various aspirants, and his presentation of the biography of Wells will, we believe, settle beyond doubt this long mooted question.

As security for the place of this notable event in the history of dentistry, Dr. William J. Gies has consented to supervise the compilation of the historic volume comprising this notable tribute to Wells and to the honor of the dental profession.

Because traveling conditions in this time of war are quite unfavorable, it seems an unpropitious time for such an event, but we trust that a rep-

resentative audience will be present to participate in this celebration which means so much to dentistry.

To Dr. E. M. Clifford, chairman of the Wells Commemorative Committee, and to Dr. Arthur H. Merritt, chairman of the Program Committee, much credit is due for their constant and indefatigable efforts in assuring the success of this event and under conditions that would discourage any but the strongest hearted proponents of the claims of Wells as the discoverer of anesthesia.

"THE EFFECT OF FLUORINE ON DENTAL CARIES"

IN a previous issue, October 1, 1944, we editorialized on the effect of fluorine in drinking water upon the carious process in the teeth. Our purpose at that time was to sound a word of warning against the empiric and indiscriminate efforts being made to apply the therapeutic properties of fluorine to the control of the carious process in the human teeth. It seems that some of our readers read into the editorial a note of alarm that was not intended by the writer. While we distinctly sounded a note of warning against the possible toxic effects of high, disproportionate concentrations of fluorides in drinking water, and though we emphasized the danger of the use of fluoride in drinking water in its empiric application to dental therapy, we did not intend to present an alarmist attitude toward its use therapeutically and with proper knowledge and realization of its harmful potentialities when used empirically.

All who have kept in touch with the studies of the effect of fluorides in the drinking water upon dental caries, from the time of its discovery by Black *et al.* readily realize that our knowledge of this developing dental therapeusis is far from complete; that much further work needs to be done from the chemical research point of view before we can say where the borderline lies between the beneficial therapeutic use and the dangerous empiric use of fluorides.

It has been definitely proved that the use of drinking waters containing fluorides exerts a positive retarding effect upon the carious process; so much so and so dramatically so that public health workers have been impelled to inaugurate what all the facts so far gleaned would seem to fully justify, clinical experimental study on a large scale, and it is in this manner only that we can determine the extent of the benefits to be gained in the application of the therapeutic properties of fluorine as available in drinking waters.

The widespread study and investigation of the value of low concentrations of fluorides have given added hope to the possibility of this agency contributing materially to the solution of the caries problem.

We would again, however, point with apprehension to the desirability of always keeping in mind the possibility of harm from the use of drinking water in high concentrations. Fluorine is a highly poisonous element and its use for therapeusis in carious conditions of the teeth should be and must be meticulously controlled to keep well within the bounds of safety.

Recognizing the retarding influence of fluorides in certain concentrations, there is a plan to inaugurate in two cities in New York an experimental study of the use of fluorides in drinking water to determine the efficacy and practicability of increasing the fluorine content of the water of one of these cities to within the limits of 0.8 to 1.0 part per million, with the second city used as a control, with less than 0.1 part per million, for a sufficient period of time to cover the ages of one generation from infancy to fourteen years.

There is abundant evidence to warrant the conclusion that dental caries is definitely less prevalent in children who from infancy have used drinking water containing fluoride.

And it would seem that the hope held forth for finding a simple and definite means of caries control fully warrants the proposed experimental study.

THE RELIEF FUND CHRISTMAS SEALS

ONCE more, at the approach of the Christmas season, it becomes our pleasurable duty to speak a good word for probably the most worthy philanthropic cause in dentistry—the sale of the Relief Commission Christmas Seals.

The Relief Commission has promoted the sale of these seals each year with the sole purpose of beneficent aid to those upon whom misfortune has fallen, and the instances in which this aid has afforded relief to the unfortunate are many.

The calls for help from unfortunate dentists who are compelled by circumstances to depend upon the generosity of their brothers are not so numerous in proportion to the number in the profession, but in war, depression and calamity, the number greatly increases and the need for

generosity and humanitarianism is greatly intensified. This year, the third year of our active participation in World War II, there will probably be an increase in the number who will have need for aid from the Relief Fund, and we appeal to all to respond to the call to the very limit of their ability.

The response thus far this year has been more extensive and generous than usual, and we attribute this to the humanitarian reaction toward the present horrible war of destruction. We know of no way in which those who are not able to take an active part in combat service can better serve dentistry and humanity.

By the time this issue of THE JOURNAL reaches its subscribers, a letter containing one hundred of these seals will have come to every member of the Association, and the success of this worthy effort waits upon a generous response from each member.

Now more than ever before, the Relief Commission needs your helpful cooperation, and we pledge for the committee the wise administration of the fund that has been conspicuously characteristic of this benevolence from its inception.

INDEX FOR 1944

THE Index for Volume 31, 1944, will be published this year separately from THE JOURNAL and will be supplied without cost to all members of the Association upon request.

The Index is being published in this manner in an effort to aid the Government in the conservation of paper.

A request slip for the Index appears on page A-62 of the Advertising section, and we urge all who wish copies of the Index to send in the request slip promptly. Requests without the slip, however, will also be honored.

CORRECTION

In the article by Dr. Charles R. Baker, entitled, "Development of the Occlusion of the Teeth," published in the November 1 issue of THE JOURNAL, illustrations, but not the legends, in Figures 8 and 9 should be transposed.—Ed.

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COUNCIL ON DENTAL HEALTH

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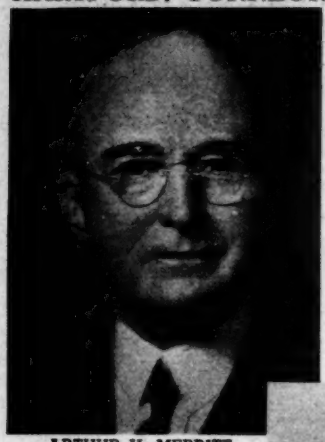
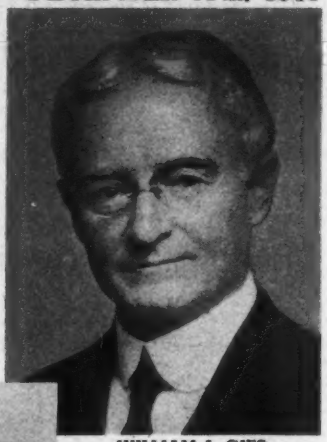
DEATHS 1683

HORACE WELLS CENTENARY

HARTFORD, CONNECTICUT **DECEMBER 11th, 1944**

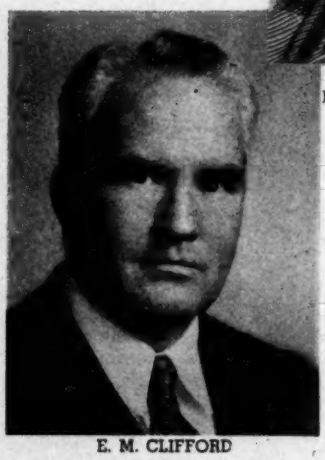


ARTHUR H. MERRITT
New York
Chairman Program Committee



WILLIAM J. GIES
New York
Editor Historic Volume

HORACE WELLS
Discoverer of Anesthesia



E. M. CLIFFORD
Hartford
Chairman Wells Centenary Committee

HOWARD R. RAPER
Albuquerque, N. M.
Biographic Glimpses of Horace Wells

Horace Wells Centenary Celebration

Hartford, Conn. **December 11, 1944**

OPENING EXERCISES

9:00 a.m., Hunt Memorial

Presiding officer: John P. Murren, D.D.S., President, Connecticut State Dental Association

Presentation of plaque to mark site of home of Horace Wells.
Harvey E. Richmond, D.D.S.

Address: William T. Mortensen, mayor of Hartford

ESSAYISTS

Hunt Memorial and Avery Memorial

9:30 Chairman: Frederic T. Murlless, Jr., D.D.S.
Essayist: Howard R. Raper, D.D.S.: "Glimpses of the Man Horace Wells"

9:30 Chairman: Clarence G. Brooks, D.D.S.
Essayist: Theodor Blum, D.D.S., M.D.: "History and Use of Local Anesthesia in Surgery"

10:30 Chairman: James Raglan Miller, M.D.
Essayist: Arno B. Luckhardt, Ph.D., M.D., F.I.C.A., "Dr. Edmund Andrews (Development of the Use of Oxygen with Nitrous Oxide)"

10:30 Chairman: Curtiss B. Hickcox, M.D.
Essayist: Charles J. Wells, M.D.: "Horace Wells, the Discoverer of Anesthesia"

11:30 Chairman: Henry Hicks, D.D.S.
Essayist: E. A. Rovenstine, M.D., professor of anesthesia, New York University College of Medicine; president of American Society of Anesthetists: "Nitrous Oxide, High-Lights and Side-Lights."

11:30 Chairman: Morton J. Loeb, D.D.S.
Essayist: Samuel C. Harvey, M.D., head of the Department of Surgery at the Yale School of Medicine: "The effect of the Introduction of Anesthesia on Surgery."

LUNCHEON PROGRAM 1:00 P.M., HARTFORD CLUB

Chairman: Eugene M. Clifford, D.D.S.
Toastmaster: Robert W. Strang, M.D., D.D.S., president of the Horace Wells Club

SPEAKERS

Gov. Raymond E. Baldwin
W. H. Scherer, President of the American Dental Association
Sen. Francis Maloney
H. Gildersleeve Jarvis, president of the Connecticut Medical Society
Arthur H. Merritt, D.D.S., Past President of the American Dental Association
Thomas Parran, M.D., Surgeon General of the U. S. Public Health Service

Message from the President

To the Members of the American Dental Profession:

The Relief Committee of the American Dental Association, first harbinger of the holiday season, greets you and brings to you your Christmas seals.

A brief report of the Relief Fund Commission, showing its status, is of interest.

Sum subscribed last year	$36,716
Returned to state societies	17,851
Amount paid to needy dentists	12,783

The dental profession today is proud of the accomplishments of its members in the Armed Services. Many programs are being planned to facilitate their relocation and return to private practice. All agencies of the A.D.A. will aid in this postwar plan.

The ravaging effects of the war have not been appreciable, but will shortly become evident. Many younger men in service have not been able to make contributions to the Relief Fund.

Praise and commendation are also due to the members of the profession on the home front, who have worked long and hard to meet the increased demand placed upon them.

Thought should be given to the veterans of the profession who have toiled beyond their physical limits to render health service to the civilian population. These fine old stalwarts of the profession, whose many years of service have slowed their pace and bent their frames, may need the dollars that these Christmas seals represent. The vicissitudes of life are many, and play no favorites.

I predict more casualties in the profession on the home front than on the battle front, owing to the increased hours and responsibilities that these men have accepted. Prosperity may be of only short duration for many of the profession. Illness, misfortune, losses and other hazards of life may render any one of us unfit for our work. To be compelled to depend on charity for an existence is a bitter and cruel experience.

The Relief Fund of the American Dental Association has been set up to meet a great need. It has been the means of making the declining years of distressed members more pleasant. You *are* your brother's keeper. Remember him. Buy Christmas seals.

W. H. SCHERER.

BUREAU OF PUBLIC RELATIONS

X-RAYS AND YOUR TEETH*

WHEN Wilhelm Conrad Roentgen discovered a "new kind of ray" in 1895, he called it an "x-ray," for the letter "x" had long been used to designate an unknown. Research has since shown that these invisible x-rays are similar to visible light, for they travel at the same speed and obey many of the same laws. The principal difference is that the x-rays are invisible and have the ability to penetrate materials that absorb or reflect visible light. This unique characteristic makes it possible to use x-rays to "see" beneath the surface of the body by projecting them through the body onto either a special screen (fluoroscope) or x-ray film (radiograph). The latter method is the one used in dentistry.

The sensitized emulsion of an x-ray film is affected by the x-rays in the same way that photographic film is affected by exposure to visible light. When x-ray film is exposed to x-rays and developed, its entire surface turns black; but if we put the film back of the teeth and project the invisible x-rays through the teeth, shadows are cast on the film by the teeth and surrounding tissues. Then, when the film is developed, images of the teeth and surrounding tissues will have been recorded, just as photographic film records a picture. The developed x-ray film is called a radiograph.

Obviously, the ability of the x-rays to penetrate various objects depends largely on the density of the substance being radiographed. Only with difficulty will this invisible light shine through metal fillings, such as the two marked F in Figure 1. Therefore, the film will be only slightly exposed and the images of the fillings will be light. On the other hand, since the x-rays will easily pass through a cavity in a tooth (C), the film will be exposed to more radiation, and the image will be dark. A study of this x-ray picture reveals that there are many other gradations of density. Radiographic diagnosis is based entirely on these differences in density.

Because he knows the anatomy of the teeth and surrounding structures in health, a dentist can recognize their normal radiographic images. This enables him to interpret x-ray pictures by means of the abnormalities that are recorded. Only after long experience does one learn to recognize the abnormal and, even then, in certain instances, supplementary clinical examinations are necessary to make a diagnosis. Laymen should never attempt to interpret x-ray pictures. A mistake, innocently made by one layman and accepted as truth by another, might easily lead to a great deal of suffering.

Radiographic interpretation is aided by the fact that dental disease either destroys the structure of the teeth and surrounding tissues or builds new tissue. If destruction occurs, the den-

*The growth of public interest in dental health has resulted in a marked increase in requests for information on different phases of the subject. To adequately meet this demand, the Public Health and Education Committee, now a subcommittee of the Council on Dental Health, authorized the preparation of a series of twelve articles in pamphlet form; each article to deal with one of the dental questions most frequently asked by the public.

"X-Rays and Your Teeth," by A. Porter S. Sweet, is the eleventh of this series to be published in THE JOURNAL. Reprints at nominal cost can be obtained by addressing the Bureau of Public Relations, American Dental Association, 222 E. Superior St., Chicago 11, Ill.

sity of the part is decreased, and this change will be shown in the x-ray picture. If new tissue is built, this change also will be evident in the x-ray picture.

There are four different types of x-ray pictures used in dentistry. The most common is called the periapical, because it records the entire tooth, including the apex of the root and some of the surrounding tissues. Figure 5 is a good example of this type of x-ray picture. Next in usefulness is the bitewing film, of which Figure 1 is a good example. Both the upper and the lower teeth are shown on the one film. The ends of the roots, however, are not recorded, which makes it impossible to discover, by this type of examination, root-end infection or abnormal conditions that exist in that area. The use of bitewing x-ray pictures is particularly effective in revealing small cavities and the early stages of pyorrhea. Occlusal films (Figure 6) are used to supplement the two previous types. These first three types are called intra-oral because the film is placed within the mouth. A fourth type, the extra-oral (Fig. 11), is thus named because the film is held outside the mouth. It is used when it becomes necessary to record larger areas than is possible when smaller films are used within the mouth.

One of the principal uses of the x-ray film is to disclose dental decay. Minute cavities such as the tiny dark notches shown at N, Figure 2, can be discovered long before it is possible to find them by means of mouth mirror and probe.

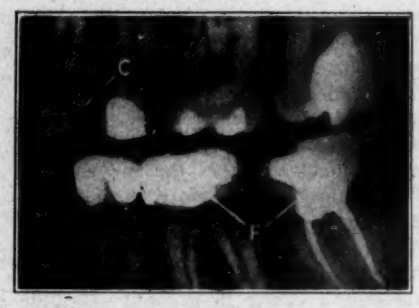


Fig. 1.—Bite-wing x-ray film.

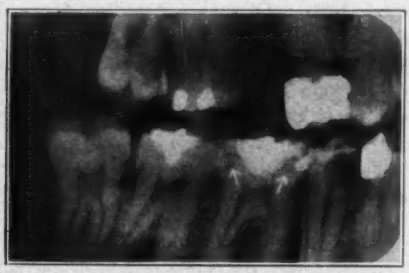


Fig. 3.—X-ray pictures aid in disclosing recurrent decay beneath old fillings.

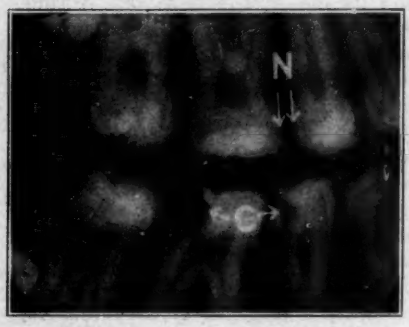


Fig. 2.—Minute cavities can be discovered by means of x-ray films.

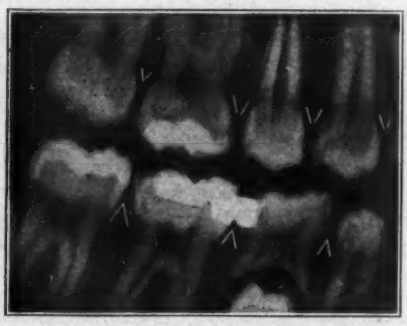


Fig. 4.—Early absorption of the bone between the teeth may be disclosed by the use of x-ray pictures.

Cavities thus discovered can be filled while they are small, and thus toothache be prevented and the large fees that would have to be paid for more difficult fillings be obviated. Large cavities, such as those shown at C, are easier to fill, if radiographed, for the dentist has a much better idea of what to do, since he can see in advance the extent of the decay.

It is often possible to discover recurrent decay within the teeth beneath old fillings, as indicated by the two arrows in Figure 3. If this decay had remained undiscovered, the tooth would probably have been lost.

Pyorrhea can be demonstrated in the x-ray film long before it is apparent on visual examination. This is because the disease attacks and destroys the crest of bone that fills the space between the roots of adjacent teeth. Such a case is shown in Figure 4, for these bony crests have already been partially destroyed. White lines have been drawn in the illustration to show the original extent of the bone.

An important use of the x-ray film is to help prevent future trouble by the discovery of hidden anomalies. By this, we mean abnormal conditions that, if undiscovered, would affect the dental health more or less seriously.

Impacted teeth, marked I, Figures 5 and 6, are teeth that are confined within the jaw, their eruption being prevented by other teeth. Many authorities advise removing these impacted teeth

Fig. 5.—A periapical x-ray picture showing an impacted third molar.

Fig. 6.—Impacted cuspid teeth.

Fig. 7.—A supernumerary or extra tooth.

Fig. 8.—X-ray pictures of children's teeth, used to disclose whether or not certain permanent teeth are present or missing.

whenever discovered, asserting that they are a constant source of danger to the health of the patient; for, if they become infected, a serious condition is apt to result. Since the younger the patient, the easier these impacted teeth can be removed, it is fortunate when they are discovered in early youth.

Fig. 9.—X-ray pictures used in the discovery of hidden infection.

Fig. 10—Left: X-ray pictures of an abscessed tooth before treatment. Right: Same tooth after treatment. All diseased teeth do not respond so satisfactorily.

It is especially important to radiograph children's teeth. If everything is normal, it is important to know it; but it is more important to recognize the many abnormal conditions that might seriously affect the future health and happiness of the child.

Supernumerary teeth (Fig. 7) are extra teeth. They are often impacted so that they crowd the roots of the erupted teeth, pushing them out of position. This makes the teeth mesh together improperly so that the food cannot be well chewed. The health is thus threatened. In the case shown (Fig. 7), the tooth marked 1 is the normal first bicuspid and that marked 2 the normal second bicuspid. The tooth marked S is the impacted supernumerary tooth, which is almost certain to cause trouble unless removed.

Once in a while, the x-rays may lead to the discovery that certain teeth have never formed and therefore are missing. In the case shown in Figure 8, an adult tooth is not forming, as it should, at A under the deciduous tooth indicated by D. To remove this baby tooth would be disastrous, for it could never be re-

placed except by an artificial tooth.

Perhaps the most dramatic use of the x-rays in dentistry is to discover hidden disease. Infected teeth can be discovered because of the destruction of tissue that has taken place. Where destruction of bone around the root has been considerable, as shown by the arrows, (Fig. 9), the lesion is readily apparent. At times, however, the evidence is so slight that magnification of the x-ray picture is necessary in order to interpret it properly.

While it is unquestionably true that some systemic diseases, such as rheu-

Fig. 11.—X-ray picture of a large cyst.

matism, can be caused by the presence of bad teeth, the mere fact that a tooth is infected does not always warrant its removal. The tooth indicated in the x-ray picture at the left in Figure 10 is badly infected. In the x-ray picture at the right, it is evident that the tissues, which have been given proper treatment, have returned to normal. All infected teeth do not respond so satisfactorily to treatment. Only one's own dentist can attempt to tell whether an abscessed tooth will respond to treatment. His patients must rely on his judgment explicitly.

Various tumors are discovered by x-ray examination. A large cyst is shown in Figure 11. This is a type of tumor that is benign, in other words is formed of normal tissue and will not return if removed. Benign tumors should be removed, however, for their continued growth will seriously affect the other teeth and, with certain types of tumor, there is a danger that they may in time become malignant.

Cancers are malignant tumors and, as such, threaten life. The growth shown in Figure 12 is a carcinoma, one that is particularly dangerous. Dental x-ray examination is important for early dis-

Fig. 12.—X-ray picture of a malignant tumor or cancer of the jaw.

covery of cancer. Bloodgood, one of the foremost authorities, advised yearly x-ray examination after age 7 as a means of discovering cancer in an early stage, while it was still small and could be successfully handled.

There are certain diseases that, instead of being destructive, build excess tissue. In hypercementosis (Fig. 13), excess tooth structure is formed on the sides and ends of the roots. This makes them overlarge and knobby. While this condition is harmless and causes no pain or discomfort, it is very difficult to extract these teeth, which sometimes becomes necessary. With the information

visualized by the x-rays, special methods can be employed and the tooth can be removed more easily.

Another important use of the x-ray picture is to assist the dentist in the actual performance of his work. In filling teeth, it can show clearly when the decay extends so near the pulp that the cavity must be drilled with care and filled so that the pulp will be protected from irritation. After the protective linings have been placed in the cavity, the x-ray will disclose whether they are properly positioned.

Even after a tooth has been filled, an x-ray picture will remove any doubts as to whether the filling fits properly in those places that cannot be seen. In the tooth in Figure 14, the filling overhangs the cavity. If the surplus is not removed, it will irritate the gum tissues and cause pyorrhea.

The x-ray film is also very useful to the dentist in preparing artificial dentures. In the first place, it assures him as to whether his appliance will be attached to healthy teeth. It can also provide information as to whether the gums and the bony ridge beneath present conditions that endanger the success of denture wearing. Unerupted teeth or retained roots (R, Fig. 15) would, unless discovered and removed, make endeavors to wear artificial teeth unsuccessful.

When teeth are to be removed, it is well to make an x-ray picture before attempting the removal, for the informa-

Fig. 13.—X-ray picture of excess tooth structure.

Fig. 14.—X-ray pictures used in the detection of poor fillings.

Fig. 15.—Broken and retained root tips discovered by means of x-ray pictures.

Fig. 16.—Oversized and crooked roots disclosed by means of x-ray pictures.

tion thus obtained frequently prevents much difficulty. Oversized roots are discovered in advance, as are crooked and curved roots such as that marked R in Figure 16, and those that diverge so widely that it would be impossible to extract the tooth without separating them. After extraction, it is well to radiograph the area involved to be sure that no pieces of bone or root are left in the socket.

CONCLUSION

Most authorities advise each individual to have a complete periapical and bitewing examination made of the teeth. This should be followed at intervals of from six to twelve months by bitewing examinations. Every few years, the periapical examination should be repeated because old conditions may change and new ones occur. An x-ray film made today will be of no use in a few months except for comparison with another one just made. If this advice is followed, all harmful and dangerous conditions will be quickly discovered and future trouble prevented.

[Author's note: It will be noted that a number of conditions visualized in the illustrations are not discussed in the text. Such discussion was omitted because the article was prepared for lay education and it was felt that too detailed a discussion would tend to bewilder the reader.]

The opinions or assertions contained in this article are the private opinions or assertions of the writer and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.—Article 113, U. S. Navy Regulations.

RADIO BROADCASTS: ELECTRICAL TRANSCRIPTIONS

Is your society looking for new and interesting radio broadcasting material? If so, we can highly recommend "Tales from Ivory Towers." These thirteen electrically transcribed fifteen minute broadcasts were written, directed and produced by professionals. Each broadcast consists of an episode, dramatically presented, from a great book that all children love. Inserted in each broadcast are two short dental health messages tuned to the spirit of the story.

"Tales from Ivory Towers" offers dental societies and boards of education an opportunity to present a unique radio program that will interest children and their parents in mouth health and good literature.

LIST OF BROADCASTS

1. "The Little Lame Prince." Muloch Craik's fairy story of the crippled child who was gifted with a magic cloak. It is particularly fitting for a health program.

2. "Winnie the Pooh." The adventures of A. A. Milne's lovable teddy bear and Piglet and Eeyore are always appealing to children.

3. "Pecos Bill." James C. Bowman's exciting tale of the cowboy with superhuman powers.

4. "Peterkin Papers." Lucretia Hale's riotous story of a rather screwball family is a familiar favorite of most children.

5. "Joan of Arc." Today, when young people are facing heroic situations all over the world, Boutet de Monvel's inspiring story of a famous heroine is particularly fitting.

6. "Call It Courage." Armstrong Sperry's exciting story of a young South Sea Islander's battle with himself to overcome his fears.

7. "Bambi." Though this story by Felix Salten is familiar to most children, it always bears repetition.

Write to the Bureau of Public Relations for complete list of broadcasts and for information regarding costs and methods of presentation.

COUNCIL ON DENTAL THERAPEUTICS

THE PRESENT STATUS OF MONOCAINE HYDROCHLORIDE

THE Council on Dental Therapeutics has authorized the following informative report for publication. The Council will continue to review evidence which may appear with regard to monocaine hydrochloride and its preparations.

DONALD A. WALLACE, *Secretary.*

Monocaine, which is similar chemically to procaine, was synthesized by Goldberg and Whitmore in 1937.[1] This anesthetic and the claims made for it were the subject of a Council report in 1939.[2] At that time, it was stated that existing evidence indicated that (1) with epinephrine, monocaine administration produces anesthesia similar to that resulting from injection of procaine hydrochloride with epinephrine; (2) monocaine is more toxic gram for gram than procaine hydrochloride, and (3) monocaine is a more potent local anesthetic gram for gram than is procaine hydrochloride.

Further clinical and experimental evidence has substantiated these facts. However, the 1939 report also called attention to the following claims that had appeared in advertising for the product: (1) that monocaine is a vasoconstrictor and synergistic with epinephrine, and (2) that it is less toxic in equivalent therapeutic doses than procaine hydrochloride. At that time, it was reported that existing evidence was insufficient to substantiate these claims and that the Council was postponing consideration of the product pending submission of further evidence suitable for a proper evaluation of the product.

Further evidence did not support the claims for vasoconstrictor properties or for less toxicity in equivalent therapeutic doses. However, it did become increasingly apparent that monocaine hydrochloride was a satisfactory local anesthetic which compared well with procaine hydrochloride and as such was accepted by the Council on Dental Therapeutics in 1941.[3]

Much of the early work on monocaine hydrochloride was poorly controlled and was of little value as a basis for scientific evaluation of the drug. However, recent reports of well-organized and well-controlled experiments by unbiased workers have provided more reliable information as to the values and limitations of this local anesthetic agent.

Probably the best clinical study of monocaine hydrochloride is that reported by Tainter and Throndson,[4] who conducted an extensive "blind test" of the comparative properties of monocaine and procaine anesthetic solutions. In this test, solutions were supplied in a composition unknown to the operator and identified only by number. In no instance was the operator or trained observer, who tabulated the pertinent data on a mimeographed form, aware of the identity of the solution being used. The procaine solution used contained 2 per cent procaine, epinephrine 1:50,000, 0.7 per cent sodium chloride and 0.1 per cent sodium bisulfite. The monocaine solution contained 1 per cent monocaine hydrochloride with 1:75,000 epinephrine, 0.8 per cent sodium chloride and 0.1 per cent sodium bisulfite. At the close of the experiment, the data were organized and tabulated. Two hundred and fifty-one patients were observed with a total of 384 injections. The results of these observations showed similar char-

acteristics for the two solutions as follows: 1. There was little difference in volume of the two solutions required to produce equivalent anesthesia. 2. The average time of onset for the two solutions was almost identical. 3. The minor changes in blood pressure, pulse rate and respiration noted in the course of anesthesia were similar for the two solutions. 4. Anesthesia was satisfactory, with about equal frequency with the two solutions. 5. There was no noticeable difference in the amount of bleeding between the two solutions, this indicating that 2 per cent procaine-epinephrine 1:50,000 has approximately the same vasoconstriction properties as 1 per cent monocaine-epinephrine 1:75,000. 6. Side actions of perspiration and tremor were equally frequent with the two solutions. 7. The amount of swelling at the site of injection of the local anesthetic, trismus and number of septic alveoli were approximately equal for the two solutions.

The solutions were found unlike in the following respects: 1. There were more painful injections with monocaine than with procaine, 24.7 per cent of injections causing tissue irritation with monocaine as compared with 14.1 per cent with procaine. 2. Fifty per cent of the patients who received monocaine were nervous as compared with 34.7 per cent of the patients who received procaine. 3. Sixteen per cent of the patients receiving monocaine became faint as compared with 5.8 per cent who received procaine. 4. Postoperatively, there was a slightly greater amount of swelling and inflammation in the operative area and a greater amount of pain at the site of injection when monocaine was used. 5. The duration of anesthesia was definitely longer with monocaine, 3.9 hours as compared with 2.7 hours for procaine.

Probably the outstanding pharmacologic study of monocaine is that reported by Schamp, Schamp and Tainter.[5, 6] These investigators carried out a rather exhaustive series of tests to determine the pharmacologic properties of monocaine. The reader is referred to the original articles for details of the experiments since space in this review will permit only a brief statement as to the methods used.

In testing for anesthetic efficiency, the median anesthetic concentration (MAC) was used for purposes of comparison. By this is meant the concentration of the test solutions which caused anesthesia in 50 per cent of the organs or tissues tested under 'standardized conditions. Tests were made by the Turck method[7] for surface anesthetic efficiency on spinal frogs with monocaine, procaine and cocaine.

These tests showed that monocaine was about twice as effective as procaine and about equal to cocaine, since 0.7 per cent monocaine, 1.53 per cent procaine and 0.6 per cent cocaine anesthetized one half the frogs within sixty minutes. Onset of anesthesia was twice as rapid for cocaine as for monocaine and procaine, but no significant difference was noted among the three as to duration of anesthesia.

Tests for topical anesthetic efficiency were also made on the rabbit cornea with procaine, monocaine and butyn, using the wink reflex as a criterion of anesthesia. The results indicated very close similarity in the potency of monocaine and of procaine, as regards concentrations required for anesthesia and time of onset and duration. Butacaine sulfate, U.S.P. (butyn sulfate) produces anesthesia quickly in from one-half to one-fourth the concentration required for procaine or monocaine, this confirming its well known potency as a corneal anesthetic.

Motor nerve paralysis was studied by means of nerve-muscle preparations of the frogs' sciatic nerves and the Harvard inductorium was used for stimuli. The data from these preparations indicated that procaine and monocaine had approximately equal efficiency as judged

by median anesthetic concentrations and onset times. Recovery times and duration were longer with monocaine. Monocaine proved more toxic for the nerves, since 49 per cent failed to recover from the 0.5 per cent solution and 70 per cent from the 1 per cent strength as compared with 4.5 per cent and 36 per cent of deaths from the same concentrations of procaine.

Tests for sensory nerve paralysis with monocaine and procaine were made by means of infra-orbital infiltration in rabbits with the wink reflex as a criterion of anesthesia and with subcutaneous wheal tests in rabbits and in man. In the infra-orbital infiltration tests, there was little significant difference noted in the efficiency of monocaine and of procaine as observed by the median anesthetic concentrations. Onset of anesthesia for both procaine and monocaine was delayed by the addition of epinephrine 1:75,000 in the monocaine and 1:50,000 in the procaine. Duration of anesthesia was considerably prolonged in both anesthetics by the addition of epinephrine, but the prolongation was much more significant in the case of monocaine, an average increase of 21.5 min. as compared to 9.5 min. increase in the case of the procaine-epinephrine solution. Furthermore, the addition of epinephrine reduced the median anesthetic concentration one half in the case of monocaine as compared with one third in the case of procaine. The authors suggest that these two effects of epinephrine may indicate a potentiation of monocaine action by its addition that is not seen to the same extent with procaine. However, in the wheal tests on rabbit skin, the procaine effects were prolonged much more by the addition of epinephrine than were those of monocaine, this casting doubt on the possible special potentiation mentioned above. Other results of the rabbit skin wheal tests showed a median anesthetic concentration of 1.5 per cent for procaine as compared with 1.2 per cent for monocaine, indicating a slightly greater potency for the latter. Addition of epinephrine almost doubled the anesthetic potency for each drug.

Wheal tests in man indicated a MAC of 0.094 per cent for monocaine as compared with 0.17 per cent for procaine. However, this advantage for monocaine disappeared when epinephrine was added, the MAC for both then being 0.027 per cent. Differences in onset time and duration were not significant.

Local effects on tissues were studied by means of the trypan blue test, histologic examination of tissues and slough tests on rats. The subcutaneous tissues of rats were irritated slightly more by the injection of monocaine than by injection of procaine as indicated by the trypan blue test and the inflammatory changes noted in tissue sections. Furthermore, 1.4 per cent monocaine caused sloughs in 50 per cent of the animals as compared with 3.4 per cent of procaine required for the same degree of irritation.

Studies on the acute fatal toxicity of monocaine and procaine were made in the white rat, white mouse and cat. When injected intravenously into healthy mice and rats, monocaine proved to be 30 to 48 per cent more toxic than procaine. Intraperitoneally, monocaine was found to be about 50 per cent more toxic than procaine in rats, but less toxic by the intraperitoneal and subcutaneous routes in white mice by 39 per cent and 24 per cent, respectively. The reversal of relative toxicities indicates decreased absorption in mice, but cannot be explained on the basis of present information. In the cat under pentobarbital anesthesia, the fatal doses of monocaine and procaine were not significantly different (35.1 mg. per kilogram and 30.9 mg. per kilogram, respectively.) However, when artificial respiration was used, the fatal dose of monocaine was 111 mg. per kilogram as compared with 454 mg. per kilogram for procaine, this indicating a

cardiovascular toxicity in monocaine approximately four times that found in procaine.

The effect of monocaine and procaine injection on the circulation were studied in rabbits and cats by a series of tests including the intravenous administration in the intact and decerebrated animal, using slough tests, strychnine tests and perfusion of rabbit ear vessels. Space will not permit an extensive description of these tests, but their results will be briefly summarized. In rabbits, monocaine did not increase the pressor effects of epinephrine. In fact, a series of 1 per cent monocaine solutions containing various concentrations of epinephrine when injected intravenously caused rises of blood pressure that were less than the rise from the same amount of epinephrine alone in the same animals. In the cat, 0.25 to 0.5 cc. of 1 per cent monocaine injected intravenously did not change the blood pressure appreciably although respiration was depressed, but monocaine plus epinephrine produced a slightly greater rise in blood pressure than did the same dose of epinephrine alone. This difference was only a few millimeters and was not consistent enough to justify claims for potentiation of the pressor effect by monocaine. However, to test this possibility, the experiment was repeated in cats whose central nervous system was destroyed by pithing and decerebration. As previously, injection of monocaine alone produced no change in blood pressure, and when monocaine was combined with epinephrine, the rises were generally smaller than those produced by the same dose of epinephrine alone. Thus, the slight increase in pressor effect from monocaine-epinephrine solutions was apparently not due to a direct effect upon the smooth muscle of the blood vessels, but rather to a slight central irritation from the monocaine-epinephrine solution.

In the slough tests, there was no evidence that the incidence of necrosis was greater in monocaine-epinephrine solutions than the additive effect of the two drugs, whereas injection of the procaine-epinephrine solutions resulted in an incidence of necrosis much greater than could be anticipated from a simple additive effect. Other reports have indicated that procaine can potentiate epinephrine reactions in certain instances, but the failure of monocaine to do so in this experiment makes claims for a synergistic action with epinephrine highly questionable.

The strychnine tests are based on interference with absorption of strychnine by the addition of vasoconstrictors to the solutions injected. The addition of monocaine or procaine to the strychnine solutions did not affect the mean lethal doses of strychnine significantly, thus failing to indicate any vasoconstrictor action for the monocaine or procaine. A control series in which epinephrine was used showed an increase median lethal dose, as would be anticipated.

Any possible direct vasoconstrictor action was tested by perfusion of the vessels of the rabbit's severed ear. Ringer-Locke solution was perfused into the central artery under constant pressure. Monocaine and procaine, with and without epinephrine, were added to the inflowing fluid. The quantity of liquid which emerged from the efferent veins was measured each minute, this indicating the degree of vasoconstriction or dilation. In this test, monocaine injection not only produced no vasoconstriction, but it actually diminished the intensity of the vasoconstriction produced by epinephrine.

From the results of these several experiments, it seems obvious that any claim or suggestion that monocaine is a vasoconstrictor or synergistic with epinephrine is not substantiated by controlled pharmacologic data. The Council on Dental Therapeutics believes that this is significant, particularly in view of the recent introduction and promotion to

the dental profession of a 1.5 per cent monocaine-epinephrine 1:100,000 solution.

Since it has been rather adequately demonstrated that monocaine has approximately a 50 per cent greater general systemic toxicity than procaine and that it is several times more toxic to the cardiovascular system, it seems obvious that a 1.5 per cent monocaine solution is definitely more toxic than the standard 2 per cent solutions of procaine. In addition, the fact that the solution contains only 1:100,000 epinephrine, in view of the demonstrated lack of vasoconstrictor properties in monocaine, would indicate a tendency for much more rapid absorption of the anesthetic agent than is seen in procaine solutions containing epinephrine in higher concentrations. The Council on Dental Therapeutics has previously considered procaine solutions of greater concentration than 2 per cent and has found them undesirable for routine dental procedures, declaring them not acceptable for A.D.R.[8] Since monocaine 1.5 per cent, epinephrine 1:100,000 would fall into the same category as to toxicity, it is the opinion of the Council that it is not a desirable agent for routine use in dentistry. It should be emphasized that the original concentration for monocaine was 0.75 per cent with epinephrine 1:75,000. This concentration was later raised to monocaine 1 per cent with epinephrine 1:75,000, which is the concentration that has been accepted by the Council. The 1.5 per cent monocaine with epinephrine 1:100,000 solution has never been accepted by the Council on Dental Therapeutics.

SUMMARY

On the basis of present evidence, the Council believes that the following conclusions are justified in regard to monocaine hydrochloride:

1. Adequate controlled pharmacologic evidence does not support the early claims that monocaine is a vasoconstrictor or is synergistic with epinephrine.

2. Gram for gram, monocaine is a more toxic anesthetic than is procaine. It is not indicated in strengths greater than 1 per cent for general use.

3. Gram for gram, monocaine has a greater anesthetic potency than procaine and may be used in less concentrated solutions. However, there is no satisfactory evidence that these monocaine solutions are less toxic than procaine solutions of equivalent potency.

4. Monocaine solutions are more injurious to tissues than equivalent procaine solutions, but the difference is not marked.

5. Monocaine has slightly greater potency as a topical anesthetic than procaine, but since this potency does not compare favorably with that of butacaine (butyn) sulfate or cocaine, it is of no clinical importance.

6. Although not all evidence is in agreement on this point, it is probable that clinical monocaine anesthesia is of somewhat greater duration than procaine anesthesia.

7. One per cent monocaine, epinephrine 1:75,000 will produce an anesthesia of approximately the same depth as that produced by 2 per cent procaine. The anesthesia may be of greater duration, but will probably have slightly more undesirable reactions during and following the operation.

In the light of present evidence, monocaine hydrochloride may be said to be one of the good anesthetic agents in a concentration of 1 per cent with epinephrine 1:75,000. For general use, this concentration of monocaine will be found comparable, but not superior, to the usual 2 per cent procaine solutions.

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2. Council on Dental Therapeutics: Preliminary Report on Monocaine Hydrochloride.

J.A.D.A., 26:1889-1890, November 1939.
3. Council on Dental Therapeutics: J.A.D.A., 28:1341-1342, August 1941.
4. TAINTER, M. L., and THRONDSON, A. H.: Clinical Results with Monocaine as Local Anesthetic. J.A.D.A., 28:1209, August 1941.
5. SCHAMP, J. R.; SCHAMP, H. M., and TAINTER, M. L.: Pharmacological Effects of Monocaine Hydrochloride. *Anesthesiology*, 3: 295-302, May 1942.
6. *Idem: Anesthesiology*, 3:398-413, July 1942.
7. SOLLMANN, TORALD, and HANZLIK, P. J.: Fundamentals of Experimental Pharmacology. San Francisco: J. W. Stacey, Inc., 1939, p. 90.
8. Council on Dental Therapeutics: Four per Cent Procaine Solutions—Not Acceptable for A.D.R. J.A.D.A., 31:278-279, February 1944.

LAVORIS—NOT ACCEPTABLE FOR A.D.R.

THE Council has voted to publish the following report, which was sent to the firm before publication. The reply of the firm contained no scientific evidence or references to the scientific literature. The firm did state that it was "currently investigating suitable sources for a further (sic) scientific and clinical study" of its products to the end that "we may amply support any statements or claims which are or may be made for it." All decisions of the Council are subject to amendment based upon acceptable evidence.

DONALD A. WALLACE, *Secretary.*

During the years since formulation of its present policy with regard to proprietary mouth washes, the Council has continued to review all claims and supporting data which promoters of proprietary mouth washes have presented. Exaggerated and unwarranted claims, unsupported by scientific evidence, continue to appear. No evidence which would indicate a reason for revision of the Council's policy on this class of products has been presented. Accordingly, the Council's opinion concerning proprietary mouth washes as stated in A.D.R., may be summarized as follows: reaffirmed.

The Council's opinion, as cited in A.D.R., may be summarized as follows: It has not been shown that the normal mouth is benefited by the use of medicated mouth washes that contain ingredients with active medicinal properties, such as astringents, protein precipitants, deodorants and germicides. The Council holds that such mouth washes can serve no more intrinsic purpose than as an aid in the mouth toilet in the removal of loose food and débris and that this limited usefulness appears to be due to the mechanics of rinsing. In this respect, water may serve as acceptably as any other mouth wash. With regard to germicidal values, there is no evidence that mouth washes as commonly used do anything more than cause a temporary decrease in the number of bacteria in the mouth. This decrease is both temporary and of no proved significance. Claims that reductions in bacterial rinse counts are indicative of the effectiveness of mouth washes in reducing the over-all or total bacterial count of the mouth are not scientifically supporting or convincing. The use of such terms as "germicide," "antiseptic" and "disinfectant" in advertising mouth washes is, therefore, misleading. Claims for the deodorant values of mouth washes are unwarranted, since the agents as commonly used do not remove the cause of oral malodors, which are often not located in the mouth. Fermentation and putrefactive processes in the mouth are not eliminated or arrested, since these processes are carried on by bacteria, which are not significantly reduced numerically by the use of mouth washes. The best that a mouth wash may do in this connection is to add its own flavored odor to that already prevailing in the mouth. This does not constitute a true deodorant action. The as-

tringent action of mouth washes may be viewed as detrimental rather than beneficial as claimed. Many drugs are irritants, astringents or caustics, their action depending on the concentration in which they are used. Even in dilute concentration, their accumulative effect may be quite significant in causing irritation. In the therapy of mouth diseases, the vasoconstricting action of astringents may be viewed as detrimental. Healing processes are dependent on an adequate blood supply to the part. Any drug action which tends to diminish the blood supply necessarily delays healing. Most astringent drugs precipitate protein and form an irritating coating over the surface of the mucous membrane to which they are applied. For a fuller discussion of this subject, refer to Accepted Dental Remedies, Edition 10.

Among the proprietary mouth washes widely promoted to the public and the profession is Lavoris, marketed by the Lavoris Company, Minneapolis, Minn. Its formula, as stated on the label, contains the following active ingredients: alcohol, zinc chloride, menthol, oil of cinnamon, formaldehyde, saccharin and oil of cloves. It is advertised as an astringent and deodorant. The package insert bears the statement, "To cleanse teeth use full strength Lavoris—brushing with a circular motion from gums to edge of teeth." A sample of Lavoris tested in the A.D.A. Bureau of Chemistry was found to have a pH value of 3.0, which is acid enough to lead one to expect that the product would decalcify tooth structure under the conditions of use recommended by the firm. The firm does not supply any evidence that the teeth would not be damaged, neither does the firm warn the prospective user of the acid nature of the product.

It is claimed that Lavoris ". . . . coagulates, detaches and clears away objectionable matter . . . without possible injury to delicate tissues," that ". . . this effective cleansing insures more vigorous and prolonged stimulation of local circulation with the attending improvement of tissue tone and resistance." The suggestion that Lavoris may be used as a rinse and that the quality of "objectionable matter" that has been detached and flushed out be observed is definitely misleading. It is also claimed that "soreness and irritation caused by wearing plates or artificial dentures are speedily relieved by rinsing the mouth each night and morning . . ." This claim is grossly unwarranted and distinctly not in the interest of denture wearers, who may suffer from such difficulties. It is advised for use after the extraction of teeth, for cold sores and fever blisters, as a deodorant for offensive breath and for allaying irritation from smoking. Evidence in support of the foregoing claims and suggested uses is not in the possession of the Council.

In view of the foregoing, the Council voted that Lavoris be declared not acceptable for admission to Accepted Dental Remedies.

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following article in the list of Accepted Dental Remedies:

Anesthetics—Local*

Procaine HCl 2%, Epinephrine 1:50,000: Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 Gm.; epinephrine, 0.00002 Gm.; sodium chloride, 0.005 Gm.; sodium bisulfite, 0.0019 Gm., and distilled water. Marketed in cartridges, approximately 2.5 cc.

Manufactured by S. F. Durst & Co., Philadelphia, Pa. Distributed by Westchester Dental Depot, Bronx, N. Y.

Admission of a product to the list of Accepted Dental Remedies does not imply a recommendation. It means that the product and the methods by which it was marketed at the time of consideration were not found to be in violation of the Council's published rules. Accepted products are reconsidered periodically. The files of the Council contain information on many drugs and dental cosmetics. All information is available, upon request, and inquiries are welcomed. A postal card will bring a prompt reply.

DONALD A. WALLACE, *Secretary.*

*A.D.R. Ed. 10, p. 39.

INSURANCE COMMITTEE

REPORT FOR 1944

To the House of Delegates:

Last year, your Insurance Committee predicted that the American Dental Association Group Insurance policy would reach $25,000,000 of coverage by July 1, 1944. We are pleased to announce that the total coverage passed that mark in June of this year, which evidences a satisfactory influx of new business as well as a continuation of our low rate of lapses.

All claims have been promptly paid; the only ones pending at this time being those for which routine proofs have not been received from the beneficiaries. Total payments to beneficiaries now exceed $2,881,000.00.

Each policy holder is now protected by a double indemnity provision added to the Master Policy January 1, 1944. This is a permanent addition to the coverage, as concerns both old policyholders and new ones. Each policy is doubled in event of death from certain accidents, and this increase is, of course, at no additional cost.

Your Insurance Committee has completed arrangements making possible the granting of a 5 per cent increase in coverage for every policyholder for the year July 1, 1944 to June 30, 1945. This increase amounts to more than $1,250,000 of free insurance for the entire group.

By virtue of the above-mentioned voluntary increases in coverage granted by The Great-West Life Assurance Company, which reflect the confidence the company has in the continued success and stability of the plan, the A.D.A. group insurance is a greater value today than ever before. Your committee is well pleased with the past progress of the case and with the outlook for the future.

Committee Expenditures—Fiscal Year 1943-1944

Office supplies and stationery	$ 27.79
Telephone and telegraph	24.41
Traveling	364.49
Postage	27.10
Printing	3.85
Stenographic services	75.74
Unclassified (maintenance)	4.20
Luncheons-dinners	4.40
Total	531.98
Budget for year	1,000.00
Balance unexpended	468.02

FRED A. RICHMOND, *Secretary*
A. D. WEAKLEY, *Chairman*
J. P. JUSTIN.

COUNCIL ON DENTAL HEALTH

SUMMARY OF REPORTS RECEIVED FROM STATE COUNCILS ON DENTAL HEALTH

MICHIGAN

THE Council on Dental Health of the Michigan State Dental Society sponsored the Physical Fitness dental program for Michigan high school students during the 1943-1944 school year. Difficulties were encountered in some communities owing to wartime problems. An evaluation questionnaire was sent to all high school superintendents for the purpose of determining whether the time and effort used on the project were justified and to stimulate high schools not thus far participating.

Questionnaires were sent to all of the 628 high schools in Michigan. Replies were received from 251, or approximately 40 per cent. Of the schools reporting, seventy-eight had some type of dental care plan for senior students and fourteen provided dental care through the resources of the families. Sixteen had no senior class. Of the 7,662 students in the seventy-eight schools reporting, 74.1 per cent received a dental examination, 28.32 per cent obtained all needed corrections and 56.9 per cent received some dental treatment in addition to an examination. Three schools reported completion of all dental corrections.

The value of a complete dental examination made under ideal conditions, including the use of x-rays, as compared to schoolroom inspection, was shown by the fact that 61 per cent of the students who received a thorough examination obtained complete dental care, while only 29 per cent received complete dental service when examined in an inspection program.

Felch Township, High School, although 25 miles from a dentist, obtained examinations for all students in private dental offices by utilizing transportation provided by the health department. The Lake Linden-Hubbel High School attributed its success in securing 76 per cent completed corrections to an intensive and well-planned dental health education program. The highest percentage of corrections was attained by the Fordson High School in Dearborn (82 per cent completed cases of the number examined) and by the Pontiac Senior High School (81 per cent completions).

The questionnaires revealed that the reason for not adopting the Physical Fitness program in thirty-two high schools was the shortage of dentists. Twelve communities used the excuse that funds necessary for treatment were not available. The opinion that dentists were too busy to cooperate in the program was responsible for non-action in eleven towns. Others reported that the needs were being taken care of by established programs. Some stated that facilities were not available, and still others that the school board was not interested.

In an open letter to school administrators and teachers, John W. Studebaker, U. S. Commissioner of Education, recently stated:

> We are fortunate in that the dentists themselves are taking an active interest in improving the dental condition of high school seniors. The emphasis just now upon the high school senior is dictated by the war needs. As educators, we need to be aware of the importance of good dental health to all pupils, girls and boys, rural and urban, elementary and high school. During the past year and a half, I have written three letters to state superintendents of pub-

lic instruction on this subject of dental health. The response has been most enthusiastic and the results have been, so far as we can judge them, excellent. Tooth decay is, however, a condition which requires continuous alertness.

Won't you see what can be done in your community now with regard to improvement in the dental health of your pupils. Only through active wholehearted cooperation of educators, dentists, and parents are the best results secured.

ALLEN O. GRUEBBEL,
Executive Secretary.

DEATHS

BABIN, HARRY J., Baton Rouge, La., Southern Dental College, Atlanta, Ga., 1905; died September 25; aged 61.

BAIRD, HOMER G., Edwardsville, Ill.; Washington University School of Dentistry, 1907; died October 13; aged 59.

BEDDLE, CLAUDE D., Leominster, Mass.; died October 9, aged 75.

BIDWELL, EVERETT E., Sioux City, Iowa; State University of Iowa, College of Dentistry, 1904; died September 15; aged 62.

BLANDFORD, GEORGE R., Roxbury, Mass.; Tufts College Dental School, 1924; died September 14; aged 43.

BOZER, FRANCIS M., Logansport, Ind.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1891; died September 25; aged 79.

BROWN, JESSE HARPER, Lansdowne, Pa.; Temple University School of Dentistry, 1901; died October 5; aged 71.

BROWN, L. R., Tucson, Ariz.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1905; died October 12.

BUGG, EMMETT PERRIN, Jacksonville, Fla.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1922; died September 26; aged 45.

CASH, DAVID T., Washington, D. C.; New York College of Dentistry, 1919; died September 23; aged 51.

COLBY, FRANK J., Forest City, Iowa; Keokuk Dental College, Dental Department of Keokuk Medical College, 1907; died October 7; aged 60.

COOK, J. FRANKLIN, Los Angeles, Calif.; University of Michigan, College of Dental Surgery, 1891; died October 2; aged 76.

COOK, W. S., Beaver Falls, Pa.; Temple University School of Dentistry, 1891; died October 17; aged 76.

COOPER, BERNARD J., Chicago, Ill.; Northwestern University Dental School; died October 28; aged 46.

CRAWFORD, M. O., Mason City, Iowa; State University of Iowa, College of Dentistry, 1909; died October 3; aged 59.

DOUGLASS, RICHARD WANLESS, St. Mary's, W. Va.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1900; died October 1; aged 72.

FALLER, HENRY S., Carlisle, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1918; died September 24; aged 47.

FERRIS, HARRY A., Corning, N. Y.; Baltimore Medical College, 1911; died September 25; aged 68.

FLOYD, T., Baxley, Ga.; Atlanta Dental College, 1905; died September 29; aged 69.

FRANK, GEORGE E., Evansville, Ind.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1892; died October 4; aged 79.

GATES, ERNEST, Boston, Mass.; Tufts College Dental School, 1909; died September 30; aged 63.

GIRLING, WINTHROP, Chicago, Ill.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1891; died October 24; aged 80.

GLASGOW, NATHANIEL B., Lower Lake, Calif.; State University of Iowa, College of Dentistry; died September 16; aged 80.

HAIN, OLIVER H., Berea, Ohio; Western Reserve University, School of Dentistry; died September 19; aged 43.

HART, HAROLD F., Boston, Mass.; Tufts College Dental School, 1913; died September 24.

HENRY, DALE S., Okemah, Okla.; Northwestern University School of Dentistry, 1915; died June 1; aged 54.

HOLTSMASTER, WALTER A., Carbondale, Pa.; University of Pittsburgh, School of Dentistry, 1925; died October 1.

INGALLS, CARL E., Angola, Ind.; Indiana University School of Dentistry, 1914; died September 20; aged 65.

IREDELL, HARVEY, New Brunswick, N. J.; Philadelphia Dental College and Garretson Hospital of Oral Surgery, 1880; died October 13; aged 88.

JAEGER, BESSIE A., Cicero, Ill.; Northwestern University Dental School, 1918; died October 16; aged 58.

KING, WILLIAM J., Oakland, Calif.; Northwestern University Dental School; died September 13; aged 75.

KOVAR, GEORGE, Boston, Mass.; Tufts College Dental School, 1919; died September 20.

KRAUSE, RALPH J., Chicago, Ill.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1931; died September 27; aged 35.

LOOMIS, BYRON EDWARD, Portland, Ore.; North Pacific College of Oregon, School of Dentistry, 1904; died June 5.

LYNCH, GEORGE A., Plattsburg, N. Y.; Baltimore College of Dental Surgery, 1915; died October 7; aged 52.

MCDOWELL, W. C., Kershaw, N. C.; Southern Dental College, Atlanta, 1901; died September 19; aged 73.

MAIDEN, W. R., Los Angeles, Calif.; died October 8; aged 75.

MATHEWS, G. E., Carrollton, Ky.; University of Louisville, School of Dentistry, 1902; died June 19; aged 68.

OSBORNE, RICHARD LEWIS, Drexel Hill, Pa., Temple University School of Dentistry, 1927; died October 14; aged 46.

PALMER, EDWARD J., Boston, Mass.; Tufts College Dental School, 1890; died September 7; aged 76.

POTTLE, LOVEJOY, Batavia, Ill.; Northwestern University Dental School, 1904; died October 6; aged 65.

POWELL, FRANK J., Wausau, Wis.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1891; died October 13; aged 76.

RITZ, CARL, Columbus, Ohio; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1889; died October 6; aged 80.

RUSSELL, J. J., Hazelton, Pa.; Medico-Chirurgical College of Philadelphia, Department of Dentistry, 1902; died October 11; aged 71.

SIMMONDS F. W., Quincy, Ill.; Northwestern University Dental School, 1899; died September 26; aged 64.

SMITH, GEORGE D., Springfield, Mo.; Northwestern University Dental School; died September 14; aged 49.

SNYDER, LIVINGSTON A., Sayville, N. Y.; New York College of Dentistry, 1888; died September 28; aged 78.

SOULIER, EUGENE E., Lafayette, La.; Tulane University of Louisiana, College of Medicine, School of Dentistry, 1905; died October 1; aged 60.

SPRAGUE, T. H., Clinton, Ill.; University of Illinois, College of Dentistry; died October 13; aged 67.

STOCKWELL, JOHN A., Worcester, Mass.; Harvard University Dental School; died September 11.

STUBBS, HARRY LUVERN, Kansas City, Kan.; Kansas City Dental College, 1911; died September 22; aged 56.

TAYLOR, E. H., Telluride, Colo.; University of Michigan, College of Dental Surgery, 1912; died September 7; aged 55.

THOMAS, JOHN DIRK, New York, N. Y.; Baltimore College of Dental Surgery, 1912; died October 6; aged 58.

UNGETHUEM, CARL F., Nashua, N. H.; died October 6; aged 71.

VANDENBERG, CLYDE, Grand Rapids, Mich.; died October 7; aged 57.

VANDERBELT, CHARLES R., Rochester, N. Y.; University of Michigan, College of Dental Surgery, 1894; died October 11; aged 75.

WALKER, W. E., Fowler, Ind., Indiana University School of Dentistry, 1896; died September 30; aged 82.

WATSON, GEORGE H., Lyons, N. Y.; University of Michigan, College of Dental Surgery, 1881; died October 8; aged 83.

WILSON, WILLIAM C., Huntingdon, Pa.; Pennsylvania College of Dental Surgery, 1897; died September 19; aged 74.

WIRT, LANDIS H., South Bend, Ind., Indiana Dental College, Indianapolis, 1902; died October 13; aged 64.

WOLMAN, BENJAMIN, Waterville, Maine; Harvard University Dental School, 1919; died October 5; aged 47.

CURRENT LITERATURE

Effect on Caries Incidence of a Single Topical Application of a Fluoride Solution to the Teeth of Young Adult Males of a Military Population

FRANCIS A. ARNOLD, JR., H. TRENDLEY DEAN and DENNIS E. SINGLETON, JR.

In a study in which a single application of a fluoride solution (5,000 parts per million) was made to the teeth of 258 cadets at the U. S. Coast Guard Academy, complete dental examinations were made one year apart, including roentgenograms and *L. acidophilus* counts of the saliva. Cadets were divided into control and experimental groups at the start of the study on the basis of comparable oral condition in regard to *L. acidophilus* count, fluoride exposure, caries experience and age. Results in 188 cadets who remained in the study throughout the year indicate: (a) no change in dental caries incidence in fluoride treated group, (b) development in control and experimental groups of about the same number of new carious surfaces or areas and (c) according to *L. acidophilus* counts during study period, no beneficial effect in the treated group. There is no evidence in this study that a single topical application of a fluoride solution of this concentration to the teeth of young adults would result in reduction of the dental caries incidence.—*J. D. Res.*, 23:155, June 1944.

Dentist's Responsibilities in Health Conservation

E. C. MCBEATH

Dentistry, now a well-established branch of health service, must be more aware of its responsibilities in health conservation, particularly with the increasing limitation of medical and dental service to the general public. The whole nation is aroused over the reports of nutritional surveys of the entire country showing a universal prevalence of malnutrition especially among the employed population. The parallelism of this widespread nutritional deficiency and the alarmingly high incidence of dental defects in selectees for military service, industrial workers, National Youth Administration applicants and the public at large appears even to the casual observer more than coincidental.

Dentistry's service to the public must be augmented for better protection and conservation of dental health. Restorative dentistry cannot compete with destructive forces and must be supplemented by preventive measures along nutritional lines. There is available for ready and practical application much acceptable and valuable information pertaining to the rôle of nutrition in the protection of dental health. Also, rapidly accumulating data from creditable investigations indicate a probable explanation of the mechanism of the effect of improved general nutrition on dental health. Recognition of these obligations involves the very integrity of the dental profession. Remuneration will come with education of the public.—*J. 2d Dist. D. Soc.*, 29:215, May 1943.

Dental Jurisprudence

JACOB FEINMAN

The field of dental jurisprudence is rapidly expanding. Some interesting legal trends center about the indemnification of dentists, employed by municipalities, from all harm or damage that may result from a malpractice suit. Dentists are individually liable for their acts whether committed in private or in public employ. However, when in public employ, the dentist may interplead his employer, either municipal or state. The latter may be sued only after prescribed conditions are complied with. One condition, namely, the statute of limitations, is often at variance in malpractice actions as against a dentist or a municipality. Thus, where an action against a city must be instituted within six months, while the same action could be instituted against the dentist within two years, an action in malpractice will be barred against both city and dentist after six months; whereas, if the action were brought within the six-month period, the dentist would be

protected against any judgment that may be rendered against him.

Another trend is away from actions in malpractice with its short period of statute of limitations, and toward actions in breach of contract. The danger of guaranteeing services or assuring a specific result lies in the fact that it facilitates an action in breach of contract. Such actions are simpler to prosecute and are often as disastrous as malpractice suits with their concomitant judgments.—*J. 2d Dist. D. Soc.*, 22:133, March 1943.

Observations on Radiolucency as a Significant Physical Property of Acrylic Dental Materials

G. L. ROBERTS

ATTENTION is directed to the fact that acrylic plastics now employed in artificial dental restorations and construction of splints for the control of fractured jaws are radiolucent and may show no shadow in the roentgenograms. Danger lies in the possibility that the roentgenologist, not realizing his inability to assist in the location of acrylic fragments traumatically dispersed in the tissues, may issue a negative finding where findings should be positive. The roentgenologist is advised to familiarize himself with plastic dental materials and consult the patient's or other dentist when in doubt.—*Brit. J. Radiol.*, 17:218, 1944.

H. B. MCCAULEY.

Treatment of Complete Transverse Maxillary Fracture with Edgewise Arch Mechanism

ROBERT B. MURRAY

A man, a shipyard worker, was struck by a crane handling pipe, complete transverse fracture of the maxillae resulting. When the mechanics offered by a Kingsley splint proved inadequate, the opinion of an orthodontist was sought and, owing to the similarity between this case and one in the literature, it was decided to institute treatment with an orthodontic appliance. Edgewise arch wing-bracket bands were placed on the mandibular bicuspids and cuspids and on the maxillary bicuspids. The four first molars carried bands with suitable sheaths. Edgewise archwires were adapted passively to both arches, and thereby a unit of anchorage was established within each dental arch. Previously prepared models indicated the desired goal of treatment. Necessary movement was achieved by variously arranged intermaxillary elastics with an elastic bandage to a headcap as an adjunct. The stability of the appliance was adequate. It was not cumbersome and was readily tolerated by the patient. It permitted the application of force in the desired direction. Some freedom in opening the mouth was possible and a maximum of mouth hygiene could be maintained. A firm and uneventful union of the parts and occlusal relationships existing prior to the accident were realized.—*Angle Orthodontist*, 13:30, January-April 1943.

Action of Vitamin D on the Incisor Teeth of Rats Consuming Diets with a High or Low Calcium : Phosphorus Ratio

J. T. IRVING

YOUNG rats weighing from 50 to 60 gm. were given modified Steenbock and Black rachitogenic diets with calcium:phosphorus ratios of 1.8, 4.4 and 0.29. After twenty-eight days on the ration, they received 18.4 international units of vitamin D. Some were injected with a sodium fluoride solution to provide a mark on the tooth. All were killed at successive intervals. The response of incisor dentin permitted computation of the time of action of the vitamin. Rats that received the diet with a calcium:phosphorus ratio of 1.8 were stunted, but the bone ash was normal. Incisors were slightly undercalcified. The action of vitamin D, detectable in twenty-four hours, caused completely normal tooth formation. Rats on the diet with a calcium:phosphorus ratio of 4.4 were rachitic, but vitamin D caused resumption of dentin calcification. A logarithmic response to varying dose levels was observed. Animals that received the diet with a calcium:phosphorus ratio of 0.29 showed a lowered bone ash and poorly calcified incisors. The vitamin therapy caused resumption of calcification on the lingual surfaces and irregular deposition of interglobular dentin labially. These responses were detectable in thirty hours. Vitamin action was apparently not restricted to intestinal absorption.—*J. Physiol.*, 103:9, 1944.

H. B. MCCAULEY.

Comminuted Fractures of the Mandible

J. B. CUTHBERT

SINCE healing of comminuted mandibular fractures is frequently delayed for many weeks by suppuration and sequestration, it was decided to treat such cases by removing all portions of bone that might sequestrate and providing drainage through submandibular incision. Speedier repair of grossly comminuted and contaminated fractures was achieved by bone grafting. In a series of twenty-five cases, eleven were treated conservatively, fourteen radically. Conservatively treated cases required an average of twenty-eight weeks to recover. The average time required for bony union in the radically treated cases was ten weeks. Conservative treatment consisted of interdental fixation and the usual procedure. Radical treatment included removal of all bone fragments of uncertain viability and bone grafting (five cases).—*Lancet*, 1:748, 1944.

PAUL H. KEYES.

Effect of Vitamin C on Gingival and Periodontal Disease in Indian Children

C. D. MARSHALL DAY and K. L. SHOURIE

ONE hundred Indian children in a Lahore orphanage were divided into two equal groups with regard for age, sex, weight and incidence of gingival disease. Each child in one group received 100 mg. of ascorbic acid orally for 100 days. Children in the other group received no supplement. Since there was no apparent improvement in the gingival condition of children in the test group after fifty days, it was decided to give local treatment to one-half of those in each group. Treatment included extractions, fillings, scaling and soft-tissue dressing. On application, the gingival conditions improved somewhat, but not strikingly. At the termination of the experimental period, no change in gingival condition could be attributed to the administration of ascorbic acid.—*Indian J. M. Res.*, 31:253, 1943.

PAUL H. KEYES.

Effect of Experimental Fracture on Bone, Dentin and Enamel

B. G. SARNAT and ISAAC SCHOUR

MANDIBLES of thirty-eight rats were fractured, twenty-nine unilaterally and nine bilaterally. Fractures were confined to bone and incisors anteriorly from the molar teeth and were not immobilized. Animals were killed from six and one-half hours to 158 days after operation. Effects were studied in living and dead animals, visually, roentgenographically and histologically. Roentgenographic findings could not be correlated with the stage of histologic repair. The mandible was occasionally grossly distorted because of posterior shifting of the buccal protuberance of the incisor base and perforation of the incisor through the inferior border. Fractured incisors showed resorption and arrested calcification of enamel matrix. In some instances, the epithelial covering was replaced by connective tissue and cementum. Dentin fragments became infiltrated by pulpal elements or periodontal membrane. The function of odontoblasts was affected as indicated by atypical secondary cementum formation. Pulp reaction varied from necrosis to complete recovery. Healing of the fractured mandible resembled the process as observed in other flat bones.—*Arch. Surg.*, 49:23, 1944.

PAUL H. KEYES.

Wounds of the Neck and Larynx

R. S. LEWIS

CERVICAL wounds appear to have received little separate consideration in the surgical writings of this war. The twelve cases described illustrate the kind of lesions and complications that may be met and the methods by which they may be treated. During early treatment, relief or prevention of respiratory obstruction, arrest of hemorrhage and prevention of infection of the wound are the main considerations. In some cases, there then follows the problem of feeding the patient if he is unable to swallow, while, in the late stages, stenosis of the air-and-food passages may have to be relieved.—*Lancet*, 1:781, June 17, 1944.

J. E. GILDA.

Fractures of the Jaw

W. A. COAKLEY and J. M. BALSER

DATA on 212 cases of fractured jaws are analyzed with respect to etiology, associated injuries, surgical service admitting, time of admission, time elapsing from injury to fixation and number and location of fractures.

No attempt is made to evaluate the findings presented.—*Am. J. Surg.*, 63:244, August 1944.

J. E. GILDA.

Maxillary Forceps

S. GORDON

THE replacement of impacted maxillary fractures is often difficult because a satisfactory instrument for reduction is not available. A pair of forceps, designed to meet this need, is illustrated. Each of them (right and left) consists of a pyramidal block with curved upper and outer (palatal) surfaces. The block is fixed on a shaft which in turn is curved to clear the teeth. Opposing it is a narrow curved rectangular blade that fits into the buccal sulcus and is hinged in the horizontal plane. Gripping surfaces are covered with latex. The right or left forceps can be used separately, or, if desired, they may be applied at the same time.—*Lancet*, 2:80, July 15, 1944.

J. E. GILDA.

Stomatitis Due to Riboflavin Deficiency

H. E. JONES, T. G. ARMSTRONG, H. F. GREEN and V. CHADWICK

STOMATITIS was observed in 1,746 of 10,313 men of many racial elements living in a camp in North Africa. The symptoms comprised sore tongue, sore lips (to a lesser extent), some degree of trismus from the cheilosis and excessive salivation. The pain was variable and did not always correspond with the degree of change observed in the mouth. The lesions on the tongue were studied with a slit-lamp.

The stomatitis developed about two months after a dietary change reduced the riboflavin intake per person per day from 1.61 mg. to about 1 mg. and was not abolished by an intake of 1.28 mg. in the following month. The condition yielded rapidly to treatment either with riboflavin (100 mg. in five days) or with fresh yeast (one-half ounce daily).—*Lancet*, 1:720, June 3, 1944.

J. E. GILDA.

Mites Infesting Carcinoma of the Jaw

R. E. HOPE SIMPSON

A WOMAN, aged 54, was found to have a growth approximately an inch long on the lower endentulous gum, extending forward about an inch from the angle of the jaw. A diagnosis of papillomatous carcinoma invading the mandible was made. The growth was found to be infested by a mite of the genus Tyroglyphus, possibly *T. longior*. Large quantities of feces were found in the material from the deeper layers of the growth. Some of the mites were living and eggs were present. These findings suggest that it had had a long stay in the tumor. Mites of this family customarily live on cheese, flour and dried fruits.—*Lancet*, 1: 740, June 3, 1944.

J. E. GILDA.

Non-Secreting Cysts of the Maxillary Sinuses

J. W. GROSSMAN and H. D. WALTZ

A CONSECUTIVE series of eighty roentgenographic sinus examinations for suspected disease disclosed thirteen indications of antral cyst formation. Six of these resulted in complete antral opacity and were found to represent the non-secreting (mesothelial) type of cyst, probably the most common type occurring in the sinuses. Even large non-secreting cysts may have meager or no local manifestations. They transilluminate satisfactorily, irrigate with negative results and may be entirely overlooked in antral puncture. However, in cases of a large cyst under pressure, severe toothache with lack of tenderness over the involved antrum may be a predominating symptom. These cysts are readily manifested in the roentgenogram, the only dependable medium for determining their presence. Roentgenographic opacity is constant in horizontal and upright positions, and there are no changes to be found in the sinus wall that would indicate invasion, infection or pressure atrophy.—*Am. J. Roentgenol. & Rad. Therap.*, 52: 136, 1944.

H. B. MCCAULEY.

Tomography of the Temporomandibular Joint and Ramus of the Mandible

C. W. C. GOUGH

DIFFICULTIES in the interpretation of standard views of the temporomandibular joint due to distortion of the neck and ramus of the mandible may be met by a simple technic of tomography. The time re-

quired to make the exposure is no greater than that for routine views and has the added advantage of improved reproducibility. Tomographs of both sides or of one side with the jaws opened or closed may be made on a single plate. A home-made tomograph attachment (Twining 1937), using a target-film distance of 40 inches with the patient's head in true lateral position, was found satisfactory. The section selected was 1 inch below the surface.—*Brit. J. Radiol.*, 17:213, 1944.

H. B. McCAULEY.

Comparison of Various Types of Local Treatment in a Controlled Series of Experimental Burns in Human Volunteers.

J. A. DINGWALL and W. DEW. ANDRUS

THE efficacy of twelve different local treatments is evaluated in a controlled series of eighty-two second-degree burns in human volunteers. Best results were found in a group treated with a sulfonamide-impregnated plastic film (sulfafilm). Almost equally good were results obtained by local treatment with a bland ointment and sulfonamides administered orally. Frequent change of dressings is contraindicated. Non-debrided lesions healed as well, and as rapidly as debrided ones. This series provides additional evidence for the abandonment of any type of treatment with escharotic agents.—*Ann. Surg.*, 120:377, September 1944.

PAUL H. KEYES.

Aerobic Non-Hemolytic Streptococci.

THEODOR ROSEBURY

AEROBIC streptococci the presence of which fails to change or discolor blood are probably the most characteristic members of the normal flora of the oral cavity. Most commonly found in the mouth and throat are *Streptococcus salivarious* and *mitior*. Greening streptococci appear to have been implicated in common oral disorders such as dental caries, pulpitis, periapical disease, gingivitis and periodontal infections, but whether they play a rôle in production of the lesions is obscure. Findings of pure cultures from such sources may reflect the employment of aerobic cultural methods such as the streaked blood-agar plate. Other micro-organisms that fail to grow aerobically are probably present in any of these lesions. There is available evidence that *Streptococcus viridans* is probably only a secondary invader in mixed infections of the oral cavity if it contributes to them at all. Any pathogenicity it might have appears to be dependent on the physical state of the host. However, the rôle of non-hemolytic streptococci in subacute bacterial endocarditis appears adequately established. An increasing number of reports indicate a close relationship between antecedent tooth extraction or other dental instrumentation and subsequent endocarditis, probably through the production of transient bacteremia.—*Medicine*, 23: 249, 1944.

H. B. McCAULEY.

Tannic Acid and the Treatment of Burns: An Obsequy.

R. D. McCLURE, C. R. LAM and H. ROMENCE

IN 1924, the use of tannic acid in the treatment of burns was introduced in the Henry Ford Hospital, Detroit. In the past twenty years, hundreds of thousands of cases have been treated with this substance. Physicians working in the same institution today recommend the abandonment of this and related methods. Clinical experience and animal experiments reveal that tannic acid moderately inhibits the healing of wounds and may produce a severe narcosis of the liver.—*Ann. Surg.*, 120:387, September 1944.

PAUL H. KEYES.

Some Observations on Dental Conditions in Possible Riboflavin Deficiency.

JOHN A. ROSS

AN interesting dental condition in which the incisor teeth become palpably loosened was observed in a large number of young native men in a Middle East military camp. A dietary deficiency of riboflavin appeared to be the cause. The condition was associated with slightly lowered blood calcium. The gingival tissues were not affected, but roentgenographic examination disclosed marked alveolar absorption and marginal osteoporosis. No abnormal changes could be found in other bones.—*Brit. J. Radiol.*, 17: 247, 1944.

H. B. McCAULEY.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

ALPHA OMEGA FRATERNITY, New York, December 4-8.

AMERICAN ACADEMY OF RESTORATIVE DENTISTRY, Chicago, February 10-11, 1945.

AMERICAN ASSOCIATION OF ORTHODONTISTS, Colorado Springs, Colo., May 21-24, 1945.

CHICAGO DENTAL SOCIETY MIDWINTER MEETING, February 12-15, 1945.

DENTAL PROTECTIVE ASSOCIATION OF THE UNITED STATES, Chicago, December 18.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second Tuesday in each month, at the Medical Society Auditorium, Washington.

THOMAS P. HINMAN MIDWINTER CLINIC, Atlanta, Ga., March 25-27, 1945.

NATIONAL BOARD OF DENTAL EXAMINERS, December 4-5.

PAN AMERICAN ODONTOLOGICAL ASSOCIATION, New York, N. Y., December 6.

GREATER PHILADELPHIA ANNUAL MEETING, January 31-February 2, 1945.

GREATER NEW YORK DENTAL MEETING, December 4-8.

ROCKY MOUNTAIN MIDWINTER MEETING, Denver, Colo., January 7-10, 1945.

STATE SOCIETIES

February 1945

Minnesota, at Minneapolis (27-March 1)

March 1945

Wisconsin (19-21)

April 1945

Kentucky, at Louisville (2-4)
Louisiana, at New Orleans (24-26)
Massachusetts, at Boston (30-May 3)
Michigan, at Detroit (16-18)
Oklahoma, at Oklahoma City (15-18)
South Carolina, at Columbia (22-24)
Virginia, at Roanoke (23-25)

May 1945

Connecticut, at Bridgeport (2-4)
Illinois, at Peoria (7-10)
Mississippi, at Jackson (6-8)
South Dakota, at Watertown (13-15)
Tennessee, at Knoxville (14-17)
Vermont, at Burlington (23-24)

June 1945

Washington, at Spokane (21-23)

STATE BOARDS OF DENTAL EXAMINERS

Colorado, at Denver, December 11-15. Ezra E. Schaefer, 724 Republic Bldg., Secretary.

Indiana, at Indianapolis, December 11-14. C. A. Frech, 504 Broadway, Gary, Secretary.

ALPHA OMEGA FRATERNITY

THE Alpha Omega Fraternity will have its headquarters at the Pennsylvania Hotel during the Greater New York Meeting, December 4-8. A luncheon will be given December 8 at 1 p.m.

SIDNEY SORRIN, *Chairman*,
745 Fifth Ave.,
New York 22, N. Y.

AMERICAN ACADEMY OF RESTORATIVE DENTISTRY

THE American Academy of Restorative Dentistry will hold its sixteenth annual meeting February 10-11, 1945, at the Stevens Hotel, Chicago.

W. SAMUEL TUCKER, *Secretary*,
940 Canal Bldg.,
New Orleans 12, La.

AMERICAN ASSOCIATION OF ORTHODONTISTS

THE next meeting of the American Association of Orthodontists will be held at the Broadmoor Hotel, Colorado Springs, Colo., May 21-24, 1945. Members of the American Dental Association are invited to attend. Credentials should be obtained in advance from the secretary of the American Association of Orthodontists or from the secretary of a constituent society.

MAX E. ERNST, *Secretary*,
1250 Lowry Medical Arts Bldg.,
St. Paul 2, Minn.

CHICAGO DENTAL SOCIETY MIDWINTER MEETING

THE eighty-first Midwinter Meeting of

the Chicago Dental Society will be held February 12-15, 1945, at the Stevens Hotel. As in previous years, the meeting will consist of a series of practical essays, limited attendance clinics, question and answer periods and table clinics. The meeting will include a large commercial exhibit at which all important firms in the dental field will be represented. George W. Hax is the general chairman of the meeting. The president of the society is Harold W. Oppice.

H. A. HARTLEY, *Secretary,*
30 N. Michigan Ave.,
Chicago 2, Ill.

DENTAL PROTECTIVE ASSOCIATION OF THE UNITED STATES

THE annual meeting of the Dental Protective Association of the United States will be held at the Palmer House, Chicago, December 18 at 5 p.m.

ELMORE W. ELLIOTT, *Secretary,*
104 Wesley Ave.,
Oak Park, Ill.

DISTRICT OF COLUMBIA DENTAL SOCIETY

THE District of Columbia Dental Society holds its meetings on the second Tuesday of every month, at the Medical Society Auditorium, 1718 M. St., N.W., Washington.

J. WALTER BERNHARD, *Secretary,*
1835 Eye St., N.W.,
Washington.

THOMAS P. HINMAN MIDWINTER CLINIC

THE Thomas P. Hinman Midwinter Clinic will be held at the Municipal Auditorium, Atlanta, Ga., March 25-27, 1945.

S. A. GARRETT, *Chairman,*
302 Medical Arts Bldg.,
Atlanta, Ga.

NATIONAL BOARD OF DENTAL EXAMINERS

THE National Board of Dental Examiners will hold its next sessions for the examination of candidates in Parts 1 and 2 December 4-5 in schools where there are five or more candidates. Applications should come through the deans. For further information, address

GORDON L. TEALL, *Secretary,*
Box 71,
Hiawatha, Kan.

PAN AMERICAN ODONTOLOGICAL ASSOCIATION

THE eighth annual dinner meeting of the Pan American Odontological Association will be held at the Hotel Pennsylvania in New York, N. Y., December 6 at 7 o'clock.

RALPH HOWARD BRODSKY,
Executive Secretary,
14 E. 81st St.,
New York, N. Y.

GREATER PHILADELPHIA ANNUAL MEETING

THE Greater Philadelphia Annual Meeting will be held January 31-February 2, 1945, at the Benjamin Franklin Hotel, Philadelphia, Pa.

ABRAM COHAN, *Chairman,*
Publicity Committee,
269 S. 19th St.,
Philadelphia 3, Pa.

GREATER NEW YORK DENTAL MEETING

THE twentieth annual Greater New York Dental Meeting will be held December 4-8, at the Hotel Pennsylvania, New York City. Comprising the program are twenty-four morning registered clinics, twenty afternoon registered clinics, forty-five table clinics and thirty topic discussions; with thirty-two speakers, seven on medical-dental subjects, and twenty-six visual education films. The dental manufacturers, supply houses and laboratories will have exhibits of the newest materials and equipment available. Programs will be available in early November. Dentists in attendance should bring with them their A.D.A. membership cards to avoid confusion in registering.

ROCKY MOUNTAIN MIDWINTER MEETING

THE thirty-eighth annual Rocky Mountain Midwinter Meeting of the Denver Dental Association will be held at the Cosmopolitan Hotel in Denver, Colo., January 7-10, 1945. William R. Humphrey is chairman.

A. G. CLARKE, *Secretary,*
Rocky Mountain Midwinter Meeting,
611 Republic Bldg.,
Denver, Colo.

CONNECTICUT STATE DENTAL ASSOCIATION

THE eighty-first annual meeting of the Connecticut State Dental Association will be held at the Hotel Stratford, Bridgeport, May 2-4, 1945.

EARLE S. ARNOLD, *Secretary.*

KENTUCKY STATE DENTAL ASSOCIATION

THE eighty-fifth annual meeting of the Kentucky State Dental Association will be held at the Brown Hotel, Louisville, April 2-4, 1945.

J. L. WALKER, *Secretary,*
640 Barbee Way South,
Louisville.

ILLINOIS STATE DENTAL SOCIETY

THE next meeting of the Illinois State Dental Society will be held May 7-10 at the Pere Marquette Hotel, Peoria.

L. H. JACOB, *Secretary,*
634 Jefferson Bldg.,
Peoria 2.

LOUISIANA STATE DENTAL SOCIETY

THE Louisiana State Dental Society will hold its annual meeting in New Orleans April 24-26 at the Roosevelt Hotel.

F. HAROLD WIRTH,
General Chairman,
Local Arrangements Committee,
829 Maison Blanche Bldg.,
New Orleans 16.

MASSACHUSETTS DENTAL SOCIETY

(Change of dates)

THE place and dates of meeting of the Massachusetts Dental Society have been changed from the Statler Hotel, Boston, May 14-17 to the Hotel Bradford, Boston, April 30-May 3.

EVELYN F. EATON, *Executive Secretary,*
106 Marlborough St.,
Boston.

MICHIGAN STATE DENTAL SOCIETY

THE eighty-ninth annual meeting of the Michigan State Dental Society will be held April 16-18 at the Hotel Statler, Detroit.

S. G. APPLEGATE,
General Chairman,
630 E. Jefferson Ave.,
Detroit.

MINNESOTA STATE DENTAL ASSOCIATION

THE sixty-second annual session of the Minnesota State Dental Association will be held in the Municipal Auditorium, Minneapolis, February 27-March 1.

L. M. CRUTTENDEN, *Secretary,*
498 Lowry Medical Arts Bldg.,
St. Paul.

MISSISSIPPI DENTAL ASSOCIATION

THE Mississippi Dental Association will hold its next annual meeting in Jackson at the Robert E. Lee Hotel, May 6-8.

O. L. COLEE, *Secretary,*
Magnolia.

OKLAHOMA STATE DENTAL SOCIETY

THE Oklahoma State Dental Society will hold its 1945 meeting in Oklahoma City April 15-18.

E. W. WISE, *Secretary.*

COLLEGE OF SURGEON DENTISTS OF PUERTO RICO

THE College of Surgeon Dentists of Puerto Rico will hold its next meeting in December.

JOSE O. PORRATA, *Secretary.*

SOUTH CAROLINA STATE DENTAL ASSOCIATION

THE seventy-fifth, "Diamond Jubilee," annual meeting of the South Carolina State Dental Association will be held at the Columbia Hotel, Columbia, April 22-24, 1945.

C. M. DOUGLAS, *President,*
State Hospital,
Columbia.

SOUTH DAKOTA STATE DENTAL SOCIETY

THE sixty-third annual session of the South Dakota State Dental Society will be held in the Grand Hotel, Watertown, May 13-15, 1945.

ERNEST W. ELMEN, *Secretary,*
Sioux Falls.

TENNESSEE STATE DENTAL ASSOCIATION

THE seventy-eighth annual meeting of the Tennessee State Dental Association will be held at the Hotel Andrew Jackson, Knoxville, May 14-17, 1945.

E. JEFF JUSTIS, *Secretary,*
1504 Exchange Bldg.,
Memphis 3.

VERMONT STATE DENTAL SOCIETY

THE next annual meeting of the Vermont State Dental Society will be held at the Van Ness Hotel, Burlington, May 23-24.

VIRGINIA STATE DENTAL ASSOCIATION

THE next annual meeting of the Virginia State Dental Association will be held in Roanoke, at the Hotel Roanoke, April 23-25.

J. E. JOHN, *Secretary,*
Medical Arts Bldg.
Roanoke.

WASHINGTON STATE DENTAL ASSOCIATION

THE next meeting of the Washington State Dental Association will be held at Spokane, June 21-23.

G. D. WILLIAMS, *President,*
511 Paulsen Bldg.,
Spokane.

WISCONSIN STATE DENTAL SOCIETY

THE 1945 meeting of the Wisconsin State Dental Society, the Diamond Jubilee, will be held March 19-21, 1945.

COLORADO STATE BOARD OF DENTAL EXAMINERS

THE Colorado State Board of Dental Examiners will hold an examination in Denver December 11-15. All credentials and fees must be filed with the secretary at least two weeks prior to the examination.

EZRA E. SCHAEFER, *Secretary,*
724 Republic Bldg.,
Denver.

INDIANA STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Indiana State Board of Dental Examiners will be held in Indianapolis, December 11-14. All applications must be in the hands of the secretary at least two weeks prior to the date of examination. For applications or information, address

C. A. FRECH, *Secretary,*
504 Broadway,
Gary.

ALPHA OMEGA

ALL Massachusetts members of Alpha Omega in service, both in this country and abroad, are requested to communicate with Abraham Gurvitz, War Service Committee, Alpha Omega Fraternity, 371 Commonwealth Ave., Boston 15, Mass.

SAMUEL S. HIRSON, *Secretary,*
Boston Alumni Chapter,
471 Commonwealth Ave.,
Boston, Mass.

COLORADO DIVISION OF PUBLIC HEALTH

THE Colorado State Board of Health recently appointed a laboratory approval committee for the purpose of revising its program pertaining to the approval of laboratories making serologic tests in accordance with the premarital and prenatal laws now in effect. The committee is now formulating the minimum standards for attainment by the various laboratories in Colorado that desire to be continued or placed upon the approved list. Laboratories performing serologic tests for syphilis will be circularized with an invitation to participate in the program. It is possible that the list circularized may not be complete. Since it is the desire that no laboratory performing serologic tests for syphilis be discriminated against, it is requested that all directors of laboratories write the secretary of the Laboratory Approval Committee, 430 State Office Bldg., Denver, for further details. The members of the committee are: A. J. Markley, professor of dermatology, and L. Florio, professor of public health and hygiene, Colorado University Medical School, Denver, chairman and vice chairman, respectively; C. W. Maynard, pathologist, Pueblo; W. Chadwick, medical director, Denver Rapid Treatment Center, Denver, and W. H. Gaub, director, Division of Laboratories, Colorado Division of Public Health, Denver, secretary.

DENTAL INTERNSHIPS AND FELLOWSHIPS

THE Walter G. Zoller Memorial Dental Clinic, University of Chicago, offers rotating internship appointments. The clinic maintains four divisions of service: 1. The Zoller Clinic in Billings Hospital for all types of dental service. 2. The University Dental Clinic in Billings Hospital for diagnosis and minor oral surgery. 3. The Prenatal Dental Clinic in Chicago Lying-In Hospital for general service. 4. The Orthopedic Dental Clinic in the Home for Destitute Crippled Children for general dentistry. In addition to clinical practice, the intern is assigned to the department of anesthesia for instruction in the administration of general anesthetics. Opportunity is afforded to witness major surgical procedures about the face and jaws.

The Zoller clinic offers fellowships to

those who desire advanced training in the basic sciences and who wish to equip themselves for dental teaching and research. Appointments carry liberal stipends and free tuition.

Interns and fellows have the privilege of attending all departmental seminars. Those interested should write for application blanks to the Director, Walter G. Zoller Memorial Dental Clinic, University of Chicago, Chicago 37, Ill.

INTERNSHIP AND VOLUNTEER EXTERNSHIPS

THERE is an internship, as well as several volunteer externships, available for recent graduates in the Dental Department of the Bronx Hospital. Opportunity is offered for training and experience in oral surgery and exodontia, orthodontia, periodontia, endodontia (root-canal therapy) and operative dentistry. Application forms can be obtained by communicating with S. Berton Gerstner, Director, Dental Department, Bronx Hospital, Fulton Ave. at 169th St., Bronx 56, N. Y.

INTERNSHIPS AND RESIDENCY

Two dental intern and one dental resident vacancies are announced by the St. Louis City Hospital, appointments available immediately. Address Leo J. Wade, M.D., medical director, Office of City Hospital, 1515 Lafayette Ave., St. Louis, Mo.

DENTAL INTERNSHIPS, NEW YORK

THE Greater New York Conference of Hospital Dental Services, comprised of a group of men who are chiefs of dental services, would like to aid those men seeking dental internships in hospitals in the metropolitan area. Those who are not in the Army or the Navy and who are desirous of obtaining internships should communicate with

MARY E. REILLY, *Secretary,*
386 Fourth Ave.,
New York, N. Y.

DENTAL INTERNSHIPS

AN internship is available to a recent dental graduate at the Research and Educational Hospital of the University of Illinois Medical Center. An unusual opportunity is afforded for training and experience in hospital dentistry and the medical aspects of dental diseases. Application forms can be obtained from the Dean, University of Illinois College of Dentistry, 808 South Wood St., Chicago 12, Ill.

DENTAL INTERNSHIPS AT EASTMAN DENTAL DISPENSARY

THERE are a number of internships available in the Eastman Dental Dispensary, Rochester, N. Y., in the various departments because of vacancies created by those who have joined the armed forces, and an unusual opportunity is afforded for training and experience in children's dentistry, exodontia and orthodontia. There will also be opportunities for promotion to the positions of chiefs of dental services. Interns are paid $1,500 to $2,000 per annum, the salary depending on the term of service. Applications should be made to

HARVEY J. BURKHART, *Director,*
P. O. Box 879,
Rochester 3, N. Y.

INTERNSHIPS IN ORAL SURGERY AND ORTHODONTICS

Two vacancies for interns in oral surgery and orthodontia will be available January 1 and April 1, 1945, at the Post-Graduate Hospital, 303 E. 20th St., New York 3, N. Y.

W. B. TALBOT, *Superintendent.*

RESEARCH FELLOWSHIPS

APPLICATIONS for Research Fellowships in Medicine, Dentistry and Pharmacy at the University of Illinois are now being considered for the year beginning September 1, 1945. Appointees to these fellowships must have completed a training of not less than eight years beyond high school graduation. The fellowship carries a stipend of $1,200 per calendar year with one month's vacation. Application blanks and further information can be secured from the secretary of the Committee on Graduate Work in Medicine, Dentistry and Pharmacy, 1853 W. Polk St., Chicago 12, Ill.

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation of the New York and the Eastman Dental Clinic, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training

in the basic medical sciences as an aid in dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Fellow in Dentistry and, according to his interests, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduate Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Applications should be made to

GEORGE H. WHIPPLE, *Dean*,
Rochester, N. Y.

FEDERAL POSITIONS FOR DENTAL HYGIENISTS

THE United States Civil Service Commission is continuing to recruit dental hygienists for federal positions. Experience is no longer necessary.

Completion of a full course leading to graduation from a recognized school of oral hygiene and registration as a dental or oral hygienist in a state, territory or the District of Columbia will qualify applicants.

Students enrolled in schools of oral hygiene may apply for federal positions when they are within nine months of completion of the course and may enter on duty on completion and registration. There are no age limits for the positions and no written tests. Appointees receive $1,970 a year entrance salary, which incorporates compensation for eight hours of overtime included in the present forty-eight hour federal work week. The majority of positions are in Army hospitals and dispensaries throughout the country, particularly in the West and Southwest. Vacancies may occur also in the Veterans Administration and the Public Health Service. Applications should be filed with the Civil Service Commission, Washington 25, D. C.

W. C. HULL, *Executive Assistant*,
United States Civil Service Commission,
Washington, D. C.

CHICAGO DENTAL SOCIETY FOURTH ANNUAL PRIZE ESSAY COMPETITION

To encourage continued scientific research in all phases of dentistry, the Chicago Dental Society again offers a cash prize of $500 to the author of the most meritorious essay reporting an original investigation and containing new and significant material of value to dentistry.

The winner of the award will be invited to present his essay at the eighty-first Midwinter Meeting of the Chicago Dental Society, to be held in Chicago February 12-15, 1945. The expenses of the winner will be paid by the society and this will be in addition to the prize of $500.

Any member of the American Dental Association or of a recognized foreign dental society, or any one affiliated with a recognized institution in the dental field may apply for authorization to enter the competition. The contest is not limited to research men having technical staffs and elaborate equipment at their disposal, but is open to any qualified person who believes that he has something new and important to contribute to dentistry. The rules are simple and fair and all contestants, whether students, teachers or practitioners, have an equal opportunity.

Application forms and contest rules can be obtained by writing to the Chicago Dental Society, 30 N. Michigan Ave., Chicago 2, Ill. All applications must be filed in the office of the society by October 2, 1944.

PRIZE ESSAY CONTEST, AMERICAN ASSOCIATION OF ORTHODONTISTS

THE Research Committee of the American Association of Orthodontists is empowered by the board of directors to conduct a prize essay contest. The prize has been set at $200 and will be offered annually until further notice. The terms of the competition are as follows:

Eligibility: Any student enrolled in a recognized university, or any person who has completed his or her formal education in orthodontia not more than two years prior

to January 1, 1945, is eligible to compete for the prize.

Essay: The essay must represent a piece of original research having a direct bearing on the field of orthodontia. It may relate either to a biologic or a clinical problem and may represent material that has been offered in partial fulfilment of the requirements of a graduate or postgraduate degree, or any graduate, postgraduate or undergraduate contest. No papers previously submitted for publication or in press will be accepted. All essays must be in the hands of the committee not later than two months prior to the annual meeting of the association. Consult the periodic literature for this date. If no essay is deemed worthy by the committee, the prize will be withheld.

Award: The prize-winning essay will be accorded a place on the scientific program of the annual meeting of the association, at which time the prize will be awarded. The association will retain publication rights of the first three choices. For further information, address

ALLAN G. BRODIE, *Chairman,*
Research Committee, A.A.O.
30 North Michigan Ave.,
Chicago 2, Ill.

COURSE OF INSTRUCTION IN INDUSTRIAL HYGIENE

COLUMBIA UNIVERSITY, through the DeLamar Institute of Public Health, announces intensive instruction in the dental aspects of industrial hygiene during the week beginning December 11. The curriculum is intended for those responsible for or interested in the dental aspects of industrial hygiene, for dentists already working in this field and for those who foresee the probability of being associated with future developments in this phase of dental practice. Instruction therefore is designed to introduce the dentist to the general field of industrial hygiene and to give him an appreciation of the entire problem of industrial health so that he may better integrate the dental aspects of this subject in the general industrial health program. Members of the DeLamar Institute of Public Health, the School of Dental and Oral Surgery and others from the College of Physicians and Surgeons, Columbia University, with guest lecturers, will constitute the faculty. Attendance will be limited to twenty-five. Persons other than dentists, in exceptional circumstances, may be admitted. Applications will be considered in the order received. The registration fee will be $25. For further information, address the Director, DeLamar Institute of Public Health, 600 W. 168th St., New York 32, N. Y.

GRADUATE SCHOOL OF MEDICINE, UNIVERSITY OF PENNSYLVANIA

THE Graduate School of Medicine of the University of Pennsylvania, organized in 1916 to provide for graduate studies in clinical medicine, has enlarged the scope of its activities to include graduate studies in dentistry, according to announcement by Dr. George William McClelland, president of the university. The graduate dental studies will be under the direction of Dr. John W. Ross, who has been appointed vice-dean for dentistry in the graduate school of medicine. He will work in cooperation with the vice deans for other medical studies under Dr. Robin C. Buerki, dean of the graduate school of medicine. In connection with the new graduate program in dentistry, courses are being planned for graduate studies in oral surgery, orthodontics, prosthetics and oral medicine-periodontics, according to Dr. Buerki.

The first period of study for those students entering on the graduate program will be devoted to basic studies involving the medical sciences as applied to the clinical specialties concerned, together with the principles and practice of that specialty, and its relation to other clinical specialties. The studies of this period will lead to a certificate.

The second period of study will be under preceptors and this period must be preceded by the basic studies at the university. The successful completion of the period of study carried on under the preceptors will lead to the degree of master of science in dentistry.

Dr. Buerki pointed out that the program in dentistry in the graduate school of medicine will be independent of the school of dentistry at the university, but that the two schools will work in complete accord, and facilities and faculty of the school of dentistry will be available for the graduate studies and special work in the respective clinical fields.